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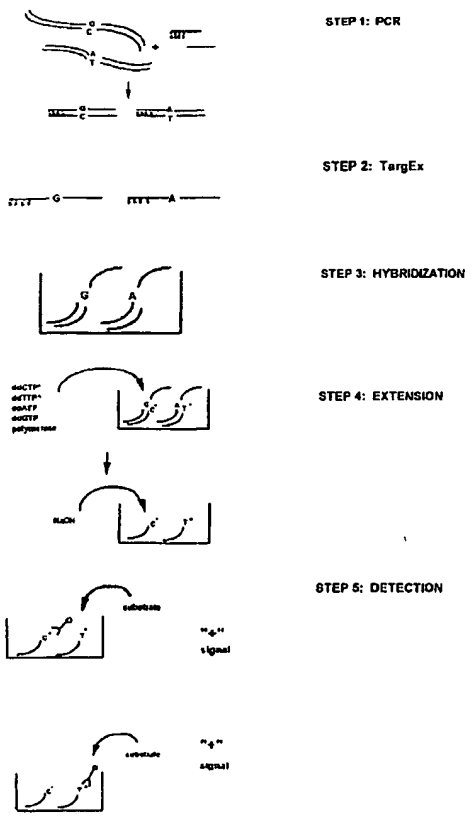

(57) Abstract: The present invention provides oligonucleotides that can be used to determine the presence, absence or identity of a single nucleotide polymorphism (SNP), kits containing such oligonucleotides, and methods of genotyping a nucleic acid sample using such oligonucleotides.

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GENOTYPING REAGENTS, KITS AND METHODS OF USE THEREOF

Background

Sequencing the human genome has provided information to dramatically change the way diseases are studied, diagnosed and treated. The fields of pharmacogenomics and pharmacogenetics focus on the variability and diversity of DNA, and how this diversity can impact biology, including response to drugs. The most common form of genetic diversity is thought to come in the form of individual DNA bases being different than the corresponding base in the average population. These single nucleotide polymorphisms ("SNPs") are a natural form of mutation, which are hereditary in nature. SNPs are viewed as both direct and indirect markers for many human diseases. Therefore, the analysis, or "scoring," of SNPs to determine their role in disease and drug efficacy can lead to the development of powerful diagnostics and therapeutics.

Adverse drug reactions (ADRs) represent the leading cause of hospitalization and mortality in the U.S., resulting in over 1.5 million hospitalizations and 100,000 deaths per year (J. Lazarou, et.al. in *The Journal of the American Medical Association (JAMA)*, (1998, 1200-1205). In addition, many promising drugs developed by pharmaceutical companies never make it through clinical development because of genetically based adverse reactions (ADRs) in a small number of patients. Therefore, scoring SNPs can identify at risk patients before the drug is prescribed and salvage potentially

useful new drugs. Alternatively, patients with SNP-induced variations in their conditions, evident in diseases like hypertension, can be identified and then prescribed the drug most appropriate for their genetic variant. Therefore, SNP analysis will be used to streamline drug discovery and development leading to safer and more effective tailor-made drugs.

Accordingly, new reagents are needed that can be used to identify whether heretofore unknown SNPs are present or absent from a given nucleic acid sample. The present invention satisfies this need and provides related advantages as well.

Summary of the Invention

In accordance with the present invention, there are provided oligonucleotides that can be used to determine the presence, absence or identity of a single nucleotide polymorphism. Invention oligonucleotides include genotyping oligonucleotides that hybridize with a portion a nucleic acid sequence listed in column 4 of Table 1, or complementary sequence thereof, and amplification oligonucleotides.

In accordance with another embodiment of the invention, there are provided kits useful for determining the presence, absence or identity of a single nucleotide polymorphism. In one embodiment, an invention kit comprises an oligonucleotide that hybridizes with a portion of a nucleic acid sequence listed in column 4 of Table 1, or complementary sequence thereof. In another embodiment, an invention kit comprises amplification oligonucleotides of columns 1 and 2 of Table 1. Also provided is an invention kit comprising an

oligonucleotide that hybridizes with a portion of a nucleic acid sequence listed in column 4 of Table 1, or complementary sequence thereof and two amplification primers.

Another embodiment of the invention provides methods of genotyping a nucleic acid sample by hybridizing a genotyping oligonucleotide to a nucleic acid sequence listed in column 4 of Table 1, or complementary sequences thereof. The genotyping oligonucleotide can then be employed in a variety of reactions, such as, for example, a primer extension reaction. Also provided is a method of genotyping a nucleic acid sample by amplifying a target nucleic acid sequence and performing a single-nucleotide primer extension reaction employing a genotyping oligonucleotide that hybridizes to the target nucleic acid sequence.

Brief Description Of The Figures

Figure 1 shows a schematic for genotyping a heterozygous nucleic acid sample containing two target nucleic acids using the particular primer extension reaction referred to as Single Nucleotide Primer Extension (SNPE) and/or GBA. In step 1, genomic DNA is amplified using a pair of PCR primers from columns 1 and 2 of the same row of Table 1 herein, in which the five most 5' nucleotides of one of the two PCR primers are linked by four exonuclease-resistant phosphorothioated linkages (e.g., 5' C-(p)-G-(p)-C-(p)-A-(p)-GTCTCAGGCCAGCT 3', for SEQ ID NO:2, where "-(p)-" represents a phosphorothioate linkage). The PCR primers are complementary to sequences flanking either side of a specific nucleotide site (e.g., the site of a SNP) in the genomic DNA, thus resulting in an amplified nucleic acid

(the target nucleic acid) containing this specific site. In step 2, the amplified PCR product target nucleic acid is subjected to T7 gene 6 exonuclease digestion, which removes the strand of the target nucleic acid that did not include the 5' phosphorothioated linkages, resulting in a single-stranded target nucleic acid. In step 3, the genotyping primer (or SNPE primer) is hybridized with the single stranded target nucleic acid such that the specific nucleotide of the target nucleic acid that is to be analyzed (i.e., the SNP) is not hybridized, and is immediately adjacent the 3' end of the genotyping primer. In step 4, a terminator reagent mixture comprising dideoxy terminators corresponding to A, C, G and T, together with a polymerase, are added to the target nucleic acid-genotyping primer complex. The polymerase extends the genotyping primer by a single base, consisting of one of the four terminators, where the added terminator base is complementary to the SNP to be determined. The terminator base that is added to the genotyping primer is labeled with a detectable marker. In the second part of step four, NaOH is added to dissociate the target nucleic acid strand which is washed away, while the genotyping primer, fixed to a solid support, remains. In step 5, a detection reagent is added, if necessary, to generate signal from the detectable marker. This can be performed in an ELISA format where an enzyme-linked antibody specific for the detectable marker of a terminator is contacted with the extended genotyping primer. When detectable markers that can be distinguished from each other are used, multiple alleles can be identified in a single well. For example, as illustrated in step 5, two alleles can be identified (C and T) by the sequential use of antibodies selective for each of the terminators (ddCTP and ddTTP).

Figures 2A and 2B show schematics for genotyping a homozygous nucleic acid sample using the Single Nucleotide Primer Extension (SNPE) by the enzyme-linked immunosorbant assay (ELISA) detection method after amplification using a phosphorothioated primer and exonuclease digestion. In figure 2A, the template strand indicated in the figure is a representative target nucleic acid molecule (such as those listed in SEQ ID NO:4n+4). The SNPE primer indicated in the figure is a representative genotyping primer (such as those listed in SEQ ID NO:4n+3). The nucleotide to be interrogated is indicated as the SNP to be typed. Primer extension is performed as described herein, in which the polymerase extension step can be performed in the presence of the terminators ddATP, ddGTP, fluorescein-ddCTP and biotin-ddUTP. The last two terminators are linked to detectable markers. Figure 2B shows the detection step after the single nucleotide primer extension results in the addition of fluorescein-ddCTP onto the 3'-end of the SNPE primer. The diagram illustrates the interaction of alkaline phosphatase-conjugated anti-fluorescein antibody and the generation of signal at OD_{405} after the addition of PNPP (p-nitrophenyl phosphate) substrate. Since the biotin-ddUTP is not incorporated, the anti-biotin horse radish peroxidase (HRP)does not bind to the primer, no reaction with the TMB (tetramethylbenzidine) substrate occurs and, hence, no signal is generated at OD_{620}.

Figure 3 shows a scatterplot of OD_{405} (X-axis) versus OD_{620} (Y-axis) resulting from SNPE that demonstrates a result that is heterozygous. The PCR primers used were oligonucleotides of SEQ ID NOs:25 and 26. The SNPE primer used was an oligonucleotide with SEQ ID NO:27. The targeted nucleic acid with the suspected polymorphism contains the sequence of SEQ ID NO:28. SNPE

was performed using fluorescein-ddCTP and biotin-ddUTP. The Y-axis corresponds to signal obtained from ddUTP incorporation and the X-axis corresponds to signal obtained from ddCTP incorporation. Each circle (●)indicates a result with a specific test sample (unknown) from an individual genomic DNA. Plus (+) symbols are positive controls using a synthetic template. Crosses (x) are negative controls where no PCR is performed.

Detailed Description of the Invention

In accordance with the present invention, there are provided oligonucleotides that can be used to determine (genotype) the presence, absence or identity of a single nucleotide polymorphism (SNP) at a preselected site in a human genomic nucleic acid sample. The location of the SNP in each SNP-containing oligonucleotide set forth in column 4 of Table 1 (also referred to herein as SEQ ID NO:4n+4, wherein n=0 through 934) herein corresponds to the nucleotide position on each SEQ ID NO:4n+4 that is immediately adjacent the nucleotide complementary to the 3' end of the corresponding genotyping oligonucleotide set forth in column 3 of the same row of Table 1. The nucleotide set forth on SEQ ID NO:4n+4 corresponding to the SNP site corresponds to the predominant polymorphism.

As set forth in Table 1, each row of oligonucleotides disclosed corresponds to a set of oligos useful for genotyping a nucleic acid sample for the presence or absence, or identity of a particular SNP. The oligonucleotides set forth in columns 1 and 2 of Table 1 (also referred to herein as SEQ ID NO:4n+1 and SEQ ID NO:4n+2, respectively, where n=0 through 934) are

used as primers to amplify the nucleic acid sample having the corresponding SNP-containing oligonucleotide from the same row in Table 1 (referred to as SEQ ID NO:4n+4, where n=0 through 934). See Figure 1. Once the nucleic acid sample having the corresponding SNP-containing oligonucleotide has been amplified, the corresponding genotyping oligonucleotide from column 3 (referred to as SEQ ID NO:4n+3, where n=0 through 934) of the same row in Table 1 is used to genotype the target nucleic acid, preferably by a primer extension reaction.

As used herein, the term "oligonucleotide", "oligo" or grammatical variations thereof, refers to polynucleic acid that can be either DNA or RNA. Invention oligos can be produced by methods well-known in art such as described in the Examples hereinafter; or the oligos can be purchased from commercial oligonucleotide production companies.

As used herein, the phrase "SEQ ID NO:4n+3, wherein n=0 through 934" refers to the group of oligonucleotides in the Sequence Listing that are set forth in column 3 of Table 1 herein (where n=(row number - 1). For example, n=0 corresponds to SEQ ID NO:3, n=1 corresponds to SEQ ID NO:7,..., n=934 corresponds to SEQ ID NO:3739 of the Sequence Listing. Likewise, SEQ ID NO:4n+1, SEQ ID NO:4n+2, and SEQ ID NO:4n+4, wherein n=0 through 934, refers to the groups of oligonucleotides set forth in columns 1, 2 and 4, respectively, of Table 1 herein.

The oligonucleotides set forth in column 3 of Table 1 (SEQ ID NO:4n+3, where n=0 through 934) are also referred to herein as genotyping oligonucleotides. In addition, for each SNP located in each oligonucleotide

set forth in column 4 of Table, there are at least four potential genotyping oligonucleotides (e.g., genotyping primers) that are hybridizable to the region one nucleotide removed from either 5' or 3' end of the SNP nucleotide (two for each strand). Two of the genotyping primers (one for each target nucleic acid strand) are complementary to the target nucleic acid and have their 3' ends one nucleotide 3' to the SNP nucleotide. These primers can be used, for example, in a polymerase primer extension reaction such as described in Goelet, P. et al., U.S. Pat No.5,888,819 and Nikiforov, T.T. et al., U.S. Pat. No. 5,518,900, which are herein incorporated by reference. The other two primers are complementary to the target nucleic acid and have their 5' ends one nucleotide 5' to the SNP nucleotide. These primers can be used in, for example, a ligase/polymerase genotyping reaction such as described in Nikiforov, T.T. et al., U.S. Pat. No. 5,679,524, or a nucleotide and terminator mixture reaction such as described in Soderlund et al., U.S. Pat. No. 6,013,431 or by Koster et al., U.S. Pat. No. 6,043,031, which is herein incorporated by reference.

In addition, the oligonucleotides set forth in column 3 of Table 1 (SEQ ID NO:4n+3, where n=0 through 934) can be made one nucleotide longer such that the nucleotide at the 3' end lies complementary to the SNP nucleotide. These primers can be used in alternate genotyping methods, for example, in allele-specific polymerase chain reaction (AS-PCR)(Newton et al., 1989, Nucl Acids Res 17:2503-2516), ligase chain reaction (LCR)(Barrany, 1991, PNAS, USA, 88: 189-193), or oligonucleotide ligation assay (OLA) (Landegren et al., 1988, Science 241:1077), where the 3' nucleotide of the genotyping primer determines the presence of the SNP nucleotide.

In addition, the oligonucleotides set forth in column 3 of Table 1 (SEQ ID NO:4n+3, where n=0 through 934) can be made one or more nucleotides shorter such that the genotyping primers are complementary to the target nucleic acid and have their 3' ends two or more nucleotides 3' to the SNP nucleotide. These primers can be used in, for example, a labeled nucleotide and terminator mixture reaction such as described in Soderlund et al., U.S. Pat. No. 6,013,431 or by Koster et al., U.S. Pat. No. 6,043,031, which is herein incorporated by reference.

The genotyping primer can be an oligodeoxyribonucleotide (DNA), an oligoribonucleotide (RNA), or a copolymer of deoxyribonucleotides and ribonucleotides. The genotyping primer can be either natural or synthetic. The genotyping primer can be synthesized either enzymatically in vivo, enzymatically in vitro, or non-enzymatically in vitro. The genotyping primer can include modifications of the ribose-phosphate backbone, such as phosphorothioate or methylphosphonate or other backbone modifications such as peptide nucleic acid (PNA). The genotyping primer can also include modifications of the nucleotide bases. The genotyping primer can be labeled with a detectable marker; this detectable marker can be different from any detectable marker present in the reaction mixture or any detectable marker attached to the target nucleic acid. In addition, for use with single-nucleotide primer extension reactions, the genotyping primer must be capable of hybridizing or annealing with nucleotides present in the target nucleic acid, immediately adjacent to, and upstream of, the nucleotide base to be identified. One way to accomplish the desired hybridization is to have the template-dependent primer be substantially

complementary or fully complementary to the known base sequence immediately adjacent to the base to be identified. The genotyping primer may be bound to a solid surface such as described in U.S. Pat. No. 5,610,287, incorporated herein by reference in its entirety. Multiple different genotyping primers can be immobilized on a surface to create an array, thus allowing the determination of multiple genotypes in a single reaction. Multiple different genotyping primers with distinct attachment means ("tags") can used for multiplex single nucleotide primer extension in solution and subsequently separated for discrete detection, such as on a nucleic acid array comprising nucleic acids complementary to the attachment means of the genotyping primers ("tag arrays").

Genotyping oligonucleotides of the invention can be as long as the nucleotide distance between an amplification primer and the SNP nucleotide, preferably not overlapping the amplification primer sequence, preferably less than 90 nucleotides, preferably less than 50 nucleotides, more preferably between 14 and 50 nucleotides, most preferably between 17 and 30 nucleotides.

When invention genotyping oligonucleotides are used in, for example, single-primer-extension reactions, hairpin loop structures can form due to self-complementarity of the nucleotides sequences of the oligo/primer. In order to disrupt the hairpin loop structure formation, "single-nucleotide-spacers" can be inserted in the midst of the hairpin loop structure. As used herein, the term "single-nucleotide-spacer" refers to any non-Watson-Crick moiety incorporated within an oligonucleotide for the purpose of weakening nucleic acid

duplex stability without altering the fidelity of the surrounding Watson-Crick base pairs. Thus, modifications to genotyping oligonucleotides contemplated herein are for the purpose of destabilizing duplex formation, specifically disfavoring intrastrand folding in favor of interstrand pairing. The location of single-nucleotide-spacers are set forth in the Sequence Listing and column 3 of Table 1 as an "X". Such moieties are well-known and available in the art and can include anucleosidic moieties, abasic moieties, non-naturally occurring nucleotide analogs, and non-Watson/Crick base moieties.

As used herein, the term "anucleosidic moieties" refers to moieties that approximate the spacing of the phosphoribose linkage. Thus, anucleosidic sites are contemplated herein as space-holders between neighboring phosphates along the oligo backbone. Examples of anucleosidic moieties for use in invention oligonucleotides include phosphoramidite-coupled multicarbon aliphatic chains that lack a nucleotide base and approximate the internucleotide spacing. For example, a C-3 linker used in DNA synthesis (3-(4,4'-Dimethoxytrityloxy)propel-1-phosphoramidite) (Glen Research, Sterling, VA) will have the approximate spacing of one nucleotide within a nucleic acid chain. Other anucleosidic sites include ethyl-like C2 and C1 linkers, rather than C3. C2- and C3-linkers are preferred as single-base length analogs. Larger anucleosidic spacers are contemplated herein having stretches of a few C2 or C3 linkers, or by incorporating a single C6 linker (for a two-base gap), or C9 (for 3 bases), and so forth up C18 linkers, and the like.

As used herein, the phrase "abasic moiety" refers to moieties that approximate the conformation of a

nucleotide but are chemically distinct from nucleotides, which include sugars or sugar analogs without base moieties. For example, an abasic site consists of the sugar-phosphate backbone without the base, such as tetrahydrofuran-phosphate (dSpacer; Glen Research, Sterling, VA), can be used as a nucleotide analog. Other backbones include those in which one or two of the non-bridging oxygen atoms of the phosphate moiety of a nucleotide have been replaced with a sulfur-containing group (especially a phosphorothioate), an alkyl group (especially a methyl or ethyl alkyl group), a nitrogen-containing group (especially an amine), and/or a selenium-containing group. In addition, peptide nucleic acids (PNAs)(Buchardt O, *Trends Biotechnol* 1993 Sep;11(9):384-6) or a carbohydrate are alternate backbones that can be used. It is contemplated that abasic modifications of these backbone types can be used as nucleotide analogs.

As used herein, "non-natural base variations" are non-canonical bases often referred to as "degenerate bases" since they exhibit some ability to base pair to any of the 4 standard bases. Exemplary non-natural base variations include, for example, "purine" and "pyrimidine" (which would be the structural scaffolds for A/G and C/T, respectively), as well as fluorine-derivatized bases, and the like. Examples of other non-natural base variations include 5-nitroindole, 3-nitropyrrole, and inosine. Numerous other "natural" base modifications that result from carcinogen exposure are also contemplated herein (see, e.g., Glen Research Catalog). The single nucleotide spacer can also include nucleotide ribose or deoxyribose analogs.

As used herein, the phrase "naturally occurring, non-Watson/Crick, bases" refers to any naturally occurring canonical base other than dA, dC, dG, dT. Common bases would be doexyinosine (dI) and deoxyuridine (dU). Other naturally occurring base variants can be found in tRNA sequences, and the like.

The single nucleotide spacer can also include non-complementary Watson/Crick nucleotide bases. An example of a mismatched nucleotide base would be the substitution of a thymidine base with an adenine base such that the intra helical base pair would be A:A instead of T:A and hence disrupt base pairing. For example, it is well known that some non-Watson/Crick pairs have moderate stability, such as G/T pairs. For any base pair, there are 6 potential mis-pairs using the standard 4 bases.

As used herein, the term "hybridize", or grammatical variations thereof, refers to the ability of two strands of nucleic acid molecules to hydrogen bond in a sequence dependent manner. For example, under appropriate conditions, complementary nucleotide sequences can hybridize to form double stranded DNA or RNA, or a double stranded hybrid of RNA and DNA. Nucleotide changes in the complementary sequence that disrupt base-pairing result in a decreased stability of the hybrid. These concepts are known in the art and described in Sambrook et al., Molecular Cloning: A Laboratory Manual 2nd ed. (1989), which is incorporated herein by reference.

Stringency levels used to hybridize a given probe with target-DNA can be readily varied by those of skill in the art. The phrase "stringent hybridization"

is used herein to refer to conditions under which nucleic acid hybrids are stable. As known to those of skill in the art, the stability of hybrids is reflected in the melting temperature (T_m) of the hybrids. In general, the stability of a hybrid is a function of GC content, cation concentration, formamide concentration and temperature. Typically, the hybridization reaction is performed under conditions of lower stringency, followed by washes of varying, but higher, stringency. Reference to hybridization stringency relates to such washing conditions.

As used herein, the phrase "moderately stringent hybridization" refers to conditions that permit target-DNA to bind a complementary nucleic acid that has about 60% identity, preferably about 75% identity, more preferably about 85% identity to the target DNA; with greater than about 90% identity to target-DNA being especially preferred. Preferably, moderately stringent conditions are conditions equivalent to hybridization in 50% formamide, 5X Denhart's solution, 5X SSPE, 0.2% SDS at 42°C, followed by washing in 0.2X SSPE, 0.2% SDS, at 65°C.

The phrase "high stringency hybridization" refers to conditions that permit hybridization of only those nucleic acid sequences that form stable hybrids in 0.018M NaCl at 65°C (i.e., if a hybrid is not stable in 0.018M NaCl at 65°C, it will not be stable under high stringency conditions, as contemplated herein). High stringency conditions can be provided, for example, by hybridization in 50% formamide, 5X Denhart's solution, 5X SSPE, 0.2% SDS at 42°C, followed by washing in 0.1X SSPE, and 0.1% SDS at 65°C.

The phrase "low stringency hybridization" refers to conditions equivalent to hybridization in 10% formamide, 5X Denhart's solution, 6X SSPE, 0.2% SDS at 42°C, followed by washing in 1X SSPE, 0.2% SDS, at 50°C. Denhart's solution and SSPE (see, e.g., Sambrook et al., Molecular Cloning, A Laboratory Manual, Cold Spring Harbor Laboratory Press, 1989) are well known to those of skill in the art as are other suitable hybridization buffers.

As used herein, the phrase "immediately adjacent the 3' end" refers to a specific first nucleotide position, typically on the target nucleic acid or on a nucleic acid having SEQ ID NO:4n+4, or complementary sequences thereof, which is immediately 5' of a second nucleotide position on the same nucleic acid, in which the second nucleotide position is complementary to the 3'-end nucleotide of SEQ ID NO:4n+3 or complementary sequence thereof. For example, Figure 2A shows a nucleotide sequence representative of a target nucleic acid sequence or a nucleic acid sequence having SEQ ID NO:4n+4, labeled "Template strand." Figure 2A also shows a nucleotide sequence representative of a nucleic acid sequence having SEQ ID NO:4n+3, labeled "SNPE primer." The 3'-end nucleotide of the SNPE primer is an "A" which is complementary to a "T" on the Template strand. The nucleic acid immediately 5' of the "T" on the Template strand is a "G," and is labeled in the figure "SNP to be typed. Accordingly, the "G" nucleotide on the Template strand, labeled as the SNP to be typed, is "immediately adjacent the 3' end" of the SNPE primer in Figure 2A.

Preferably, the invention oligonucleotides corresponding to SEQ ID NOs:4n+1 and 4n+2, where n=0

through 934 (i.e., columns 1 and 2 of Table 1) can be used as two amplification primers for increasing the amount of target nucleic acids (set forth in column 4 of Table 1) containing the SNP. In addition, in view of the target nucleic acids disclosed herein in column 4 of Table 1, those of skill in art can readily design additional amplification primers that can amplify larger target nucleic acid fragments comprising the target nucleic acids set forth in column 4. Likewise, it is contemplated herein that those of skill in art can readily design additional amplification primers that can amplify smaller target nucleic acid fragments, so long as the smaller target nucleic acid comprises the SNP-site set forth in column 4. The amplification primer pairs are designed such that the primers generate a target nucleic acid strand complementary to the genotyping primer and resistant to degradation, for example, by 5'-3' exonuclease.

As used herein, a nucleic acid that is "resistant to degradation" or "degradation-resistant" is a nucleic acid that is resistant to chemical degradation, acid hydrolysis, base hydrolysis, or other chemical-induced hydrolysis, or is resistant to enzymatic degradation. A nucleic acid that is resistant to enzymatic degradation can be resistant to exonuclease activity, endonuclease activity, and the like. In a preferred embodiment, a nucleic acid that is resistant to degradation is resistant to 5'-3' exonuclease activity, by using phosphorothioation, and the like.

A method of using 5'-3' exonuclease in the preparation of target nucleic acids is the subject of Nikiforov et al., U.S. Patent 5,518,900, which is herein incorporated by reference. Examples of 5'-3' exonuclease

resistant nucleic acids are disclosed in Zon, G. et al., (Anticancer Drug Design 6:539-568 (1991)) and Goodchild, J. et al. (Bioconjugate Chem. 1:613-629 (1990), both of which are incorporated herein by reference in their entirety. In general, suitable degradation-resistant nucleotide derivatives in which one or two of the non-bridging oxygen atoms of the phosphate moiety of a nucleotide have been replaced with a sulfur-containing group (especially a phosphorothioate), an alkyl group (especially a methyl or ethyl alkyl group), a nitrogen-containing group (especially an amine), and/or a selenium-containing group, etc. Other modifications that confer degradation resistance such as 5'-3' exonuclease resistance can be used, for example, peptide nucleic acids (PNAs) (Buchardt, O. *supra*) or 2'-O-methyl ribose modified nucleic acids Srivastava S., C. et al., U.S. Pat. No. 5,214,135. Degradation resistance is preferably achieved by the primer containing a phosphorothioate modification at the 5' end of the nucleic acid and, in a preferred embodiment, containing four phosphorothioate linkages at the 5' end.

The selected nucleotide derivative is suitable for *in vitro* primer-mediated extension and provides nuclease resistance to the region of the nucleic acid molecule in which it is incorporated. In a preferred embodiment, a nucleotide derivative confers resistance to exonucleases that attack double-stranded nucleic acids from the 5'-end (5'-3' exonucleases). Examples of such exonucleases include bacteriophage T7 gene 6 exonuclease and bacteriophage lambda exonuclease. Both exonucleases are inhibited by the presence of phosphorothioate bonds so as to allow the selected degradation of the unmodified nucleic acid strand. However, any double-strand specific, 5'-3' exonuclease can be used for this process,

provided its activity is affected by the presence of the modified nucleotides. The preferred enzyme when using phosphorothioate derivatives is the T7 gene 6 exonuclease, which shows maximal enzymatic activity in the same buffer used for many DNA dependent polymerase buffers including Taq polymerase. The 5'-3' exonuclease resistant properties of phosphorothioate derivative-containing DNA molecules are discussed, for example, in Kunkel, T.A. et al. (In: Nucleic Acids and Molecular Biology, Vol. 2, 124-135 (Eckstein F. et al., eds.), Springer-Verlag, Berlin, (1988)). The 3'-5' exonuclease resistant properties of phosphorothioate nucleotide containing nucleic acid molecules are disclosed in Putney et al. (Proc. Natl. Acad. Sci. (U.S.A.) 78:7350-7354 (1981)) and Gupta A.P. et al. (Nucl. Acids Res., 12:5897-5911 (1984)).

The amplification primers can be used to generate amplified nucleic acid products by any *in vitro* amplification method known to those skilled in the art that uses a DNA dependent or RNA dependent DNA or RNA polymerase. The preferred method is the polymerase chain reaction (PCR) that involves template-dependent extension using thermally stable DNA polymerase (Mullis K et al, Cold Spring Harbor Symp. Quant. Biol. 51:263-273 (1986); Erlich H et al.,EP 50,424; EP 84,796, EP 258,017, EP 237-362; Mullis K., EP 201,184; Mullis, K. et al, U.S. Pat. No. 4,683,202; Erlich, H., U.S. Pat. No. 4,582,788; and Saiki, R. et al., U.S. Pat. No. 4,683,194), incorporated herein by reference. PCR achieves the amplification of a specific nucleic acid sequence using two oligonucleotide primers complementary to regions of the sequence to be amplified. Extension products incorporating primers then become templates for subsequent amplification steps. Reviews of the polymerase chain reaction are provided by

Mullis, K.B., (*supra*); Saiki, R.K. et al., (Bio/Technology 3:1008-1012 (1985)); and Mullis, K.B. et al. (Meth. Enzymol. 155:335-350 (1987)), which is incorporated herein by reference.

Other nucleic acid amplification procedures can be used and include transcription-based amplification systems (Kwoh, D. et al., Proc. Natl. Acad. Sci. (U.S.A.) 86:1173 (1989)); Gingeras T.R. et al., PCT appl. WO 88/10315 (priority: U.S. patent application Ser. Nos. 064,141 and 202,978); Miller, H.I. et al., PCT appl. WO 89/06700 (priority: U.S. patent application Ser. No. 146,462); Davey, C. et al., (European Patent Application Publication No. 329,822)), RNA-dependent RNA amplification (Qβ replicase (Kramer, F.R. et al., U.S. Pat. No. 4,786,600), and ligation-based amplification systems (Wu, D.Y. et al., Genomics 4:560 (1989)).

Amplification primers can be any length but are preferably as long as 90 nucleotides, preferably between 14 to 50 nucleotides, more preferably between 17 and 30 nucleotides.

In accordance with another embodiment of the invention, methods are provided for genotyping a nucleic acid sample comprising hybridizing an invention oligonucleotide to the nucleic acid sample, and preferably, performing a primer extension reaction .

As used herein, the term "genotyping" refers to determining the presence, absence or identity of a nucleotide base (e.g., a SNP) at a specific position in a target nucleic acid. First, a sample containing the target nucleic acid is treated, if such nucleic acid is double-stranded, so as to obtain unpaired nucleotide

bases spanning the specific position. If the target nucleic acid is single-stranded, this step is not necessary. Second, the sample containing the target nucleic acid is contacted with a genotyping oligonucleotide (also referred to as a genotyping primer) under hybridizing conditions. The genotyping oligonucleotide is capable of hybridizing with a stretch of nucleotide bases present in the target nucleic acid, adjacent the nucleotide base to be identified (e.g., a SNP), so as to form a duplex between the genotyping oligo and the target nucleic acid. When the genotyping oligonucleotide is "immediately adjacent" the nucleotide base to be identified (e.g., a SNP), the genotyping oligonucleotide hybridizes with the target nucleic acid in such a way that either the 3' or 5' end of the genotyping oligonucleotide is complementary to a nucleotide on the target nucleic acid that is located immediately 5' or 3', respectively, of the nucleotide base to be identified (see, e.g., Figure 2A and 2B). It is also contemplated herein that the invention genotyping oligos can be fragments of the oligos in column 3 of the Table 1 (i.e., SEQ ID NO:4n+3, n=0-934) hybridizable to the target nucleic acid and adjacent to the nucleotide base to be identified such that the 3' end of the genotyping oligo is 1 up to 10, preferably 3 up to 6, nucleotides upstream from the nucleotide base to be identified in the target nucleic acid.

As used herein , the phrase "primer extension" refers to enzymatic extension of the genotyping primer in the resultant duplex by one or more nucleotides, catalyzed, for example, by a DNA polymerase, and the like. Such primer extension thus depends on correct base pairing of the added nucleotide to the nucleotide base to be identified.

In one embodiment, the duplex of genotyping primer and target nucleic acid can then be contacted with a reagent containing at least two, but preferably four terminators, at least one of which terminators being labeled. The duplex of genotyping primer and the target nucleic acid is contacted with the reagent under conditions permitting base pairing of a complementary terminator present in the reagent with the nucleotide base to be identified and the occurrence of a template-dependent, primer extension reaction so as to incorporate a terminator at the 3' end of the primer. The net result is that the genotyping primer has been extended by one terminator. Next, the presence or absence of a labeled terminator at the 3' end of the extended genotyping primer is detected. The identity of the labeled terminator indicates which terminator has base paired to the next base in the target nucleic acid. Since the terminator is complementary to the next base in the target nucleic acid, the identity of the next base in the target nucleic acid is thereby determined.

It is also contemplated that the genotyping primer can be extended by a nucleic acid template-dependent ligation reaction. In such a reaction, a ligating oligonucleotide is used that hybridizes to the target nucleic acid only if the nucleotide residue corresponding to the SNP on the target molecule is complementary to the corresponding nucleotide on the ligating oligonucleotide. If such a ligating oligonucleotide hybridizes with the target nucleic acid, the ligating oligonucleotide and the genotyping oligonucleotide will be immediately adjacent each other. The genotyping primer and ligating primer can then be ligated by contacting the target nucleic acid, genotyping

primer and ligating oligonucleotide with a nucleic acid ligase. The ligation reaction can ligate the 5' end of the genotyping primer to the 3' end of the ligating primer, or alternatively, the ligation reaction can ligate the 3' end of the genotyping primer to the 5' end of the ligating primer. Either the genotyping primer or the ligating oligonucleotide can be labeled with a detectable marker. The detection of a ligation product indicates the presence of the SNP nucleotide targeted by the ligation primer.

As used herein, a detectable marker is any molecule or structure that can be detected by spectroscopic, scattering, emission, absorption, binding, or other known detection methods known in the art. Exemplary detectable markers include a radionuclide, a fluorochrome, a colorimetric agent, a magnetic substance, an electron-rich material such as a metal, a luminescent tag, or a detectable binding agent such as biotin. Preferably, the detectable marker is a fluorochrome or a detectable binding agent. More preferably, the detectable marker is a fluorescent dye or a detectable binding agent that can be bound by an antibody. In one embodiment, the detectable marker is biotin or fluorescein. A detectable binding agent refers to any substance that can bind a solid support, a probe molecule, or other molecule that binds the detectable binding agent and, in turn, is then detected or permits identification of the nucleic acid which is labeled with the detectable binding agent. For example, a detectable marker can be biotin which is bound by an antibody specific to biotin, whereupon the antibody can then be detected in an ELISA-based assay. Other detectable markers known in the art may be used in the invention assay, for example, markers listed in the catalog of

Molecular Probes (Eugene, OR), markers listed in the catalog of Synthegen (Houston, TX), and markers listed in WO 98/59066, which are all herein incorporated by reference.

It is further contemplated herein that one or more primer extension reactions, used in genotyping a nucleic acid sample comprising one or more different target nucleic acids, can be carried out in the same reaction vessel. In one embodiment, at least one terminator is labeled with a detectable marker. In another embodiment, one or more genotyping primers are each labeled with a detectable marker. Detection of identity of the SNPs on the one or more target nucleic acids can then be carried out using one of a variety of methods including spectroscopic detection of one or more detectable markers, separation of one or more nucleic acid sequences used to identify the identity of the corresponding one or more SNPs. Such methods for the detection of one or more SNPs in a single reaction vessel are described in WO 98/59066, which is herein incorporated by reference.

In a preferred embodiment, the primer extension reaction is a "single-nucleotide primer extension" as described, for example in United States Patent No. 5,679,524 and in United States Patent No. 5,888,819, incorporated herein by reference in their entirety. In this method, a genotyping primer hybridizes with the target nucleic acid immediately adjacent the nucleotide base to be identified, so as to form a duplex between the genotyping primer and the target nucleic acid such that the nucleotide base to be identified is the first unpaired base in the template target nucleic acid immediately downstream of the 3' end of the genotyping

primer in the duplex of genotyping primer and target nucleic acid. In this embodiment, primer extension will add a single terminator residue which is complementary to the base to be determined in the target nucleic acid. Identification of the terminator will thus provide identification of the base on the target nucleic acid to be determined.

Typically, two or more terminators are labeled, each labeled with a different detectable marker, thereby permitting simultaneous detection (and hence, identification) of the two or more labeled terminators. Preferably four terminators are labeled, each with a different detectable marker, thereby permitting simultaneous detection and identification of up to four labeled terminators.

In the embodiment in which only one terminator is labeled (a first labeled terminator), the above-described primer extension procedure can be repeated at least once, using a second labeled terminator that is different from the first labeled terminator. This process can be repeated once, twice or three times, using a different, labeled terminator for each repetition.

As used herein, the phrase "nucleic acid sample" refers to one or more of target nucleic acids, which can be from any source. The sample of target nucleic acids can be natural or synthetic (i.e., synthesized enzymatically in vitro). The sample of target nucleic acids can comprise deoxyribonucleic acids (DNAs), ribonucleic acids (RNAs), or copolymers of deoxyribonucleic acid and ribonucleic acid. The target nucleic acid can be a deoxyribonucleic acid (DNA), a ribonucleic acid (RNA), or a copolymer of

deoxyribonucleic acid and ribonucleic acid. The target nucleic acid can be synthesized enzymatically in vivo, synthesized enzymatically in vitro, or synthesized non-enzymatically. The sample containing the target nucleic acid or acids can comprise genomic DNA from an organism, RNA transcripts thereof, or cDNA prepared from RNA transcripts thereof. The sample containing the target nucleic acid or acids can also comprise extragenomic DNA from an organism, RNA transcripts thereof, or cDNA prepared from RNA transcripts thereof. Preferably, the target nucleic acid or acids are synthesized by amplification methods described herein. More preferably, the target nucleic acid or acids are synthesized by the polymerase chain reaction.

The sample can be taken from any organism, but is preferably human. Some examples of organisms to which the method of the subject invention is applicable include plants, microorganisms, viruses, birds, vertebrates, invertebrates, mammals, humans, horses, dogs, cows, cats, pigs, or sheep. For assay of genomic DNA, virtually any biological tissue samples can be used, including whole blood, semen, saliva, tears, urine, fecal material, sweat, buccal, skin and hair. Genomic DNA is typically amplified by PCR, and the like, before analysis.

The target nucleic acid can comprise one or more moieties that permit affinity separation of the target nucleic acid from the unincorporated reagent and/or the primer. The target nucleic acid can comprise biotin which permits affinity separation of the target nucleic acid from the unincorporated reagent and/or the primer via binding of the biotin to streptavidin which is attached to a solid support. The sequence of the target nucleic acid can comprise a DNA sequence that permits

affinity separation of the target nucleic acid from the unincorporated reagent and/or the primer via base pairing to a complementary sequence present in a nucleic acid attached to a solid support. The target nucleic acid can be labeled with a detectable marker; this detectable marker can be different from any detectable marker present in the reagent or attached to the primer.

In a preferred embodiment, the target nucleic acid sequence is synthesized by an amplification method and is modified at the 5' end to prevent hydrolysis by, for example, exonuclease activity, as described herein. See, for example, United States Patent 5,518,900, which describes a method for generating single-stranded nucleic acid molecules containing nuclease-resistant nucleotides.

The genotyping primer can comprise one or more moieties that permit affinity separation of the primer from the unincorporated reagent and/or the target nucleic acid. The genotyping primer can comprise biotin which permits affinity separation of the primer from the unincorporated reagent and/or target nucleic acid via binding of the biotin to streptavidin which is attached to a solid support. The sequence of the genotyping primer can comprise a DNA sequence that permits affinity separation of the primer from the unincorporated reagent and/or the target nucleic acid via base pairing to a complementary sequence present in a nucleic acid attached to a solid support.

In another embodiment of the invention, a method is provided for genotyping a nucleic acid sample comprising:

a) amplifying a target nucleic acid sequence that hybridizes to an oligonucleotide selected from the group of SEQ ID NOs consisting of 4n+3, or complementary sequences thereof; and

b) performing a single-nucleotide primer extension reaction employing an oligonucleotide comprising a nucleic acid selected from the group of SEQ ID NOs consisting of 4n+3, or complementary sequences thereof,

wherein n=0 through 934 and is the same value in both steps a and b.

As used herein, a target nucleic acid sequence that hybridizes to an oligonucleotide selected from the group of SEQ ID NOs consisting of 4n+3 or complementary sequences thereof refers to a target nucleic acid comprising a sequence substantially similar to at least a portion of nucleic acid of SEQ ID NO:4n+4, or complementary sequences thereof that hybridizes to a nucleic acid of SEQ ID NO:4n+3. Typically, such a target nucleic acid sequence will comprise the nucleic acid of SEQ ID NO:4n+4 with the exception of the nucleotide immediately adjacent the 3' end of the nucleic acid of SEQ ID NO:4n+3, which may or may not be present, where n is the same value for both SEQ ID NOs:4n+3 and 4n+4.

In a further embodiment of the invention, a kit is provided which contains at least one genotyping primer. As used herein, a kit refers to a genotyping system in kit form, comprising at least one invention genotyping primer, and optionally further comprising chain termination reagent in combination with a DNA polymerase with or without an associated 3' to 5'

exonuclease function, and an appropriate salt and cofactor mixture, in a suitable packaging material. Invention kits are useful for assaying for the presence or absence of a nucleotide at a specified location on one or more target nucleic acids. Preferably, the invention kit is useful for determining the identity of a nucleotide at a specified location on one or more target nucleic acids. To facilitate the assaying for the presence or absence, or determining the identity of the SNP nucleotide on the target nucleic acid, the invention kit provides a genotyping primer, one or more terminators, or both a genotyping primer and one or more terminators, that are labeled with a detectable marker.

The conditions for the occurrence of the template-dependent, primer extension reaction can be created, in part, by the presence of a suitable template-dependent enzyme. Some of the suitable template-dependent enzymes are DNA polymerases. The DNA polymerase can be of several types. The DNA polymerase must, however, be primer and template dependent. For example, E. coli DNA polymerase I or the "Klenow fragment" thereof, T4 DNA polymerase, T7 DNA polymerase ("Sequenase"), Thermus aquaticus DNA polymerase, or a retroviral reverse transcriptase can be used. RNA polymerases such as T3 or T7 RNA polymerase can also be used in some protocols. Depending upon the polymerase, different solution conditions and different temperature ranges are used for the hybridization and extension reactions.

The reagents of the subject invention typically permit the typing of nucleic acids of interest by facilitating the analysis of the 3' terminal addition of terminators to a specific primer or primers under specific hybridization and primer extension conditions.

Using only one terminator in the chain termination reagent as the nucleoside triphosphate substrate ensures addition of only one nucleotide residue to the 3' terminus of the primer in the polymerase reaction. Using all four terminators simultaneously ensures fidelity, i.e., suppression of misreading.

A genotyping primer of an invention kit comprises a genotyping primer as described above, which is capable of hybridizing to a target nucleic acid. An invention kit comprises one or more genotyping primers. In one embodiment of an invention kit, the genotyping primer(s) comprises any of SEQ ID NO:4n+3, or the complement thereof, where n=0 to 934. In another embodiment the genotyping primer(s) comprises a portion of any of SEQ ID NO:4n+4, or the complement thereof, where n=0 to 934. In yet another embodiment the genotyping primer(s) hybridizes with any of SEQ ID NO:4n+4, or the complement thereof, where n=0 to 934.

A suitable kit includes at least one invention genotyping primer, and optionally further comprising chain termination reagent in combination with a DNA polymerase with or without an associated 3' to 5' exonuclease function, and an appropriate salt and cofactor mixture, as a separately packaged chemical reagent(s) in an amount sufficient for at least one assay. Instructions for use of the packaged reagent are also typically included. Those of skill in the art can readily incorporate invention genotyping primers into kit form in combination with appropriate buffers and solutions for the practice of the invention methods as described herein.

In another embodiment, an invention kit comprises a genotyping primer and two amplification primers. This kit can also comprise chain termination reagent in combination with a DNA polymerase with or without an associated 3' to 5' exonuclease function, and an appropriate salt and cofactor mixture to be used in conjunction with the genotyping primer, and can also comprise nucleotide reagent in combination with a DNA polymerase with or without an associated 3' to 5' exonuclease function, and an appropriate salt and cofactor mixture to be used in conjunction with the amplification primers, in a suitable packaging material. Such invention kits are useful for (1) amplifying one or more target nucleic acid sequences in a nucleic acid sample and (2) assaying for the presence or absence of a nucleotide at a specified location on one or more target nucleic acids. Preferably, invention kits are useful for (1) amplifying one or more target nucleic acid sequences in a nucleic acid sample and (2) determining the identity of a nucleotide at a specified location on one or more target nucleic acids.

Preferably, a kit comprising one genotyping primer and two amplification primers comprises a genotyping primer that hybridizes to the sequence SEQ ID NO:4n+4 and amplification primers of the sequence SEQ ID NOs:4n+1 and 4n+2, where n=0 through 934 and the three oligonucleotides correspond to SEQ ID NOs having the same value for n.

More preferably, a kit comprising one genotyping primer and two amplification primers comprises a genotyping primer of the sequence SEQ ID NO:4n+3 and amplification primers of the sequence SEQ ID NOs:4n+1 and 4n+2, where n=0 through 934 and the three

oligonucleotides correspond to three consecutive SEQ ID NOs having the same value for n.

In yet another embodiment of the invention, a kit comprises two amplification primers. This kit can also comprise nucleotide reagent in combination with a DNA polymerase with or without an associated 3' to 5' exonuclease function, and an appropriate salt and cofactor mixture to be used in conjunction with the amplification primers, in a suitable packaging material. Such invention kits are useful for amplifying one or more target nucleic acid sequences in a nucleic acid sample.

A termination reagent of an invention kit refers to a reagent comprising at least one terminator. Preferably, a termination reagent comprises two terminators. More preferably, a termination reagent comprises three terminators. Most preferably, a termination reagent comprises four terminators. A termination reagent will comprise one or more terminators labeled with a detectable marker. Preferably, a termination reagent comprises two or more terminators labeled with a detectable marker. More preferably, a termination reagent comprises three or more terminators labeled with a detectable marker. Most preferably, a termination reagent comprises four or more terminators labeled with a detectable marker.

A nucleotide reagent of an invention kit for use in an amplification reaction refers to a reagent comprising at least one nucleotide triphosphate. Preferably, a nucleotide reagent comprises two nucleotide triphosphates. More preferably, a nucleotide reagent comprises three nucleotide triphosphates. Most

preferably, a nucleotide reagent comprises four nucleotide triphosphates.

In a particularly preferred embodiment, an invention kit comprises a collection reagents termed "Master Mix" as described in Example I. Exemplary Master Mix 2x is as follows: 768 mL of sterile, distilled water 200 mL of 10xPCR salts (100 mM Tris-HCl, pH 8.5, 500 mM KCl, 15 mM $MgCl_2$ and 0.01% Gelatin) and 8 mL of each dNTP stock (100 mM stocks of deoxyribonucleotide triphosphates dATP, dCTP, dGTP, and dTTP) in sterile, distilled H_2O. The final composition being: 50 mM Tris-HCl, pH 8.5, 100 mM KCl, 3 mM $MgCl_2$, 0.002% Gelatin, and 800 µM each dNTP. This solution can be stored at -20°C until use. Master mix can be prepared in a variety of different concentrations, described as a function of x, as the above example depicts 2x Master Mix. The concentration of the master mix employed herein may vary from 0.5x, 1x, 2x, or 5x, to as high as 10x, 20x, or 50x. Preferably, the master mix is from 2x to 5x.

In addition, in place of Tris-HCl, any other buffer which does not interfere with the enzymatic and/or detection processes of required to detect the presence, absence or identity of a SNP may be used. Such buffers include the so-called "Good buffers", and other organo-amino based buffers, and the like. Similarly, the pH may be adjusted to any range capable of carrying out the desired processes. The pH may range from as low as about 6.0, 7.0, or 8.0, to as high as about 8.5, 8.7, or 9.0. Preferably, the pH ranges from about 7.0 to about 8.7. More preferably, the pH ranges from about 8.0 to about 8.5. Buffer concentration may vary from as low as 10 mM, 25 mM or 50 mM, to as high as 75 mM, 100 mM or 200 mM.

Preferably, the buffer concentration is from 25 mM to 100 mM.

In place of KCl, other monovalent-cation salts can be used. Other exemplary monovalent-cation salts include salts with the cation: NH_4^+, alkalai metal ions Li^+, Na^+, Rb^+, Cs^+, and other monovalent cations. The anion can be any anion which does not adversely influence the amplification reaction. Exemplary anions are halide anions, F^-, Cl^-, Br^-, I^-, and other anions such as phosphate, sulfate, nitrate, and the like. The concentration of the monovalent salt can be as low as 15 mM, 40 mM, or 75 mM, to as high as 100 mM, 150 mM or 250 mM. Preferably, the monovalent-cation salt concentration is from about 75 to 150 mM.

In place of $MgCl_2$, other divalent-cation salts can be used. Other exemplary divalent-cation salts include salts with the cation: Mg^{2+}, Ca^{2+}, Mn^{2+}, Cu^{2+}, Zn^{2+}, Cd^{2+}, and other divalent cations. The anion can be any anion which does not adversely influence the amplification reaction. Exemplary anions are halide anions, F^-, Cl^-, Br^-, I^-, and other anions such as phosphate, sulfate, nitrate, and the like. The concentration of the divalent salt can be as low as 0.5 mM, 1 mM, or 3 mM, to as high as 5 mM, 10 mM or 25 mM. Preferably, the divalent-cation salt concentration is from about 1 mM to 10 mM.

In place of gelatin, other volume exclusion agents can be used such as polyvinyl pyrrolidone, polyethlene glycol, polyacrylamide, linear polyacrylamide, and the like. The volume exclusion reagent can be absent, or can be as low as 0.0001%, 0.0005% or 0.001%, to as high as 0.002%, 0.005% or 0.02%.

Preferably, the volume exclusion agent is about 0.001% to 0.005%.

The concentration of each of dCTP, dGTP, dATP and dTTP (i.e., the dNTPs) can vary in concentration from 250 μM, 500 μM, or 800 μM, to 1 mM, 1.5 mM or 2.5 mM. Preferably, the concentration of the dNTPs is about 500 μM to 1 mM.

As employed herein, the phrase "packaging material" refers to one or more physical structures used to house the contents of the kit, such as invention primers, and the like. The packaging material is constructed by well known methods, preferably to provide a sterile, contaminant-free environment. The packaging material has a label which indicates that the invention probes can be used for determining the presence or absence of, or preferably the identity of, a particular nucleotide on a target nucleic acid, thereby genotyping the target nucleic acid. In addition, the packaging material contains instructions indicating how the materials within the kit are employed to determine the presence or absence of, or preferably the identity of, a particular nucleotide on a target nucleic acid.

The packaging materials employed herein in relation to diagnostic systems are those customarily utilized in nucleic acid-based assay systems. As used herein, the term "package" refers to a solid matrix or material such as glass, plastic, paper, foil, and the like, capable of holding within fixed limits an isolated nucleic acid, oligonucleotide, or primer of the present invention. Thus, for example, a package can be a glass vial used to contain milligram quantities of a contemplated nucleic acid, oligonucleotide or primer, or

it can be a microtiter plate well to which microgram quantities of a contemplated nucleic acid probe have been operatively affixed.

"Instructions for use" typically include a tangible expression describing the reagent concentration or at least one assay method parameter, such as the relative amounts of reagent and sample to be admixed, maintenance time periods for reagent/sample admixtures, temperature, buffer conditions, and the like.

It is contemplated herein that each of the genotyping and amplification primers described herein can be used in the invention methods of genotyping nucleic acid samples, for example, to assess by association analysis the genotype of an individual, or group of individuals, having a pathological phenotypic trait suspected of being caused by one or more single nucleotide polymorphisms. Phenotypic traits suitable for association analysis include diseases that have known but yet unmapped genetic components, e. g., agammaglobulinemia, diabetes insipidus, Lesch-Nyhan syndrome, muscular dystrophy, Wiskott-Aldrich syndrome, Fabry's disease, familial hypercholesterolemia, polycystic kidney disease, hereditary spherocytosis, von Willebrand's disease, tuberous sclerosis, hereditary hemorrhagic telangiectasia, familial colonic polyposis, Ehlers-Danlos syndrome, osteogenesis imperfecta, and acute intermittent porphyria, and the like.

Phenotypic traits also include symptoms of, or susceptibility to, multifactorial diseases of which a component is or may be genetic, such as autoimmune diseases, inflammation, cancer, system, diseases of the nervous system and infection by pathogenic

microorganisms. Some examples of autoimmune diseases include rheumatoid arthritis, multiple sclerosis, diabetes (insulindependent and non-independent), systemic lupus erythematosus and Graves disease, and the like. Some examples of cancers include cancers of the bladder, brain, breast, colon, esophagus, kidney, oral cavity, ovary, pancreas, prostate, skin, stomach, leukemia, liver, lung, and uterus, and the like.

Phenotypic traits also include characteristics such as longevity, appearance (e. g., baldness, obesity), strength, speed, endurance, fertility, and susceptibility or receptivity to particular drugs or therapeutic treatments.

Such correlations can be exploited in several ways. In the case of a strong correlation between a polymorphic form and a disease for which treatment is available, detection of the polymorphic form set in a human or animal patient may justify immediate administration of treatment, or at least the institution of regular monitoring of the patient. Detection of a polymorphic form correlated with serious disease in a couple contemplating a family may also be valuable to the couple in their reproductive decisions. For example, the female partner might elect to undergo in vitro fertilization to avoid the possibility of transmitting such a polymorphism from her husband to her offspring. In the case of a weaker, but still statistically significant correlation between a polymorphic set and human disease, immediate therapeutic intervention or monitoring may not be justified. Nevertheless, the patient can be motivated to begin simple life-style changes (e. g., diet, exercise) that can be accomplished at little cost to the patient but confer potential benefits in reducing the risk of conditions to which the

patient may have increased susceptibility by virtue of variant alleles. After determining polymorphic form(s) present in an individual at one or more polymorphic sites, this information can be used in a number of methods.

In addition, determination of which polymorphic forms occupy a set of polymorphic sites in an individual identifies a set of polymorphic forms that distinguishes the individual. See generally, National Research Council, The Evaluation of Forensic DNA Evidence (Eds. Pollard et al., National Academy Press, DC, 1996). Thus, each of the genotyping and amplification primers described herein can be used in the invention methods of genotyping nucleic acid samples, for example, to identify a distinguishing or unique set of forensic markers in an individual useful for forensic analysis. For example, one can determine whether a blood sample from a suspect matches a blood or other tissue sample from a crime scene by determining whether the set of polymorphic forms occupying selected polymorphic sites is the same in the suspect and the sample. If the set of polymorphic markers does not match between a suspect and a sample, it can be concluded (barring experimental error) that the suspect was not the source of the sample. If the set of markers does match, one can conclude that the DNA from the suspect is consistent with that found at the crime scene. If frequencies of the polymorphic forms at the loci tested have been determined (e. g., by analysis of a suitable population of individuals), one can perform a statistical analysis to determine the probability that a match of suspect and crime scene sample would occur by chance (see, e.g, WO 95/12607). If several polymorphic loci are tested, the cumulative probability of non-identity for random individuals becomes very high (e. g.,

one billion to one). Such probabilities can be taken into account together with other evidence in determining the guilt or innocence of the suspect.

In addition, each of the genotyping and amplification primers described herein can be used in the invention methods of genotyping nucleic acid samples, for example, to identify a distinguishing or unique set of markers in an individual useful for paternity analysis. The object of paternity testing is usually to determine whether a male is the father of a child. In most cases, the mother of the child is known and thus, the mother's contribution to the child's genotype can be traced. Paternity testing investigates whether the part of the child's genotype not attributable to the mother is consistent with that of the putative father. Paternity testing can be performed by analyzing sets of polymorphisms in the putative father and the child. If the set of polymorphisms in the child attributable to the father does not match the putative father, it can be concluded, barring experimental error, that the putative father is not the real father. If the set of polymorphisms in the child attributable to the father does match the set of polymorphisms of the putative father, a statistical calculation can be performed to determine the probability of coincidental match (see, e.g., WO 95/12607). If several polymorphic loci are included in the analysis, the cumulative probability of exclusion of a random male is very high. This probability can be taken into account in assessing the liability of a putative father whose polymorphic marker set matches the child's polymorphic marker set attributable to his/her father.

The single nucleotide polymorphisms set forth in column 4 of Table 1 (also referred to herein as SEQ ID NO:4n+4, wherein n=0 through 934) may contribute to the phenotype of an organism in different ways. Some of these polymorphisms may occur within a protein coding sequence and contribute to phenotype by affecting protein structure. The effect may be neutral, beneficial or detrimental, or both beneficial and detrimental, depending on the circumstances. For example, a heterozygous sickle cell mutation confers resistance to malaria, but a homozygous sickle cell mutation is usually lethal. Others of these polymorphisms may occur in noncoding regions but may exert phenotypic effects indirectly via influence on replication, transcription, and translation. A single polymorphism may affect more than one phenotypic trait. Likewise, a single phenotypic trait may be affected by polymorphisms in different genes. Further, some of these polymorphisms may predispose an individual to a distinct mutation that is causally related to a certain phenotype.

Phenotypic traits include diseases that have known but yet unmapped genetic components. Phenotypic traits also include symptoms of, or susceptibility to, multifactorial diseases of which a component is or may be genetic, such as autoimmune diseases, inflammation, cancer, diseases of the nervous system, and infection by pathogenic microorganisms. Some examples of autoimmune diseases include rheumatoid arthritis, multiple sclerosis, diabetes (insulin-dependent and non-independent), systemic lupus erythematosus and Graves disease. Some examples of cancers include cancers of the bladder, brain, breast, colon, esophagus, kidney, leukemia, liver, lung, oral cavity, ovary, pancreas, prostate, skin, stomach and uterus. Phenotypic traits

also include characteristics such as longevity, appearance (e. g., baldness, obesity), strength, speed, endurance, fertility, and susceptibility or receptivity to particular drugs or therapeutic treatments.

Correlation is performed for a population of individuals who have been tested for the presence or absence of a phenotypic trait of interest and for polymorphic markers sets. To perform such analysis, the presence or absence of a single or a set of polymorphisms (i. e. a polymorphic set) is determined for a set of the individuals, some of whom exhibit a particular trait, and some of which exhibit lack of the trait. The alleles of each polymorphism of the set are then reviewed to determine whether the presence or absence of a particular allele is associated with the trait of interest. Correlation can be performed by standard statistical methods such as a chi-squared test and statistically significant correlations between polymorphic form(s) and phenotypic characteristics are noted. For example, it might be found that the presence of allele A1 at polymorphism A correlates with heart disease. Such correlations can be exploited in several ways as set forth above.

For example, in the case of a strong correlation between a set of one or more polymorphic forms and a disease for which treatment is available, detection of the polymorphic form set in a human or animal patient may justify immediate administration of treatment, or at least the institution of regular monitoring of the patient. Thus, the methods of genotyping nucleic acid samples described herein can be used, for example, to diagnose any of more than 3000 genetic diseases currently known or to be identified,

e.g., hemophilias, thalassemias, Duchene Muscular Dystrophy (DMD), Huntington's Disease (HD), Alzheimer's Disease and Cystic Fibrosis (CF), and the like.

It is also contemplated herein that each of the genotyping and amplification primers described herein can be used in the invention methods of genotyping nucleic acid samples, for example, for assessing the pharmacogenomic susceptibility of a subject harboring a single nucleotide polymorphism to a particular pharmaceutical compound, or to a class of such compounds. Genetic polymorphism in drug metabolizing enzymes, drug transporters, receptors for pharmaceutical agents, and other drug targets have been correlated with individual differences based on distinction in the efficacy and toxicity of the pharmaceutical agent administered to a subject. Pharmocogenomic characterization of a subjects susceptibility to a drug enhances the ability to tailor a dosing regimen to the particular genetic constitution of the subject, thereby enhancing and optimizing the therapeutic effectiveness of the therapy.

All U.S. patents and all publications mentioned herein are incorporated in their entirety by reference thereto. The invention will now be described in greater detail by reference to the following non-limiting examples.

Examples

Example I

Preparation of 2x Master Mix for PCR

A component of genotyping using SNPE is accurate and efficient amplification of the nucleic acid region being tested for the SNP. To facilitate control of the PCR used, a reaction mixture, referred to herein as "2x Master Mix," has been produced to achieve more successful PCRs.

2x Master Mix was prepared as follows: 10xPCR salts was 100 mM Tris-HCl, pH 8.5, 500 mM KCl, 15 mM $MgCl_2$ and 0.01% Gelatin, stored in a -20°C freezer. 100 mM stocks of deoxyribonucleotide triphosphates dATP, dCTP, dGTP, and dTTP (dNTPs) (LTI, Bethesda, MD) were made in sterile, distilled H_2O. To 768 mL of sterile, distilled water 200 mL of 10xPCR salts and 8 mL of each dNTP stock was added. The final composition was: 50 mM Tris-HCl, pH 8.5, 100 mM KCl, 3 mM $MgCl_2$, 0.002% Gelatin, and 800 µM each dNTP. The solution was stored at -20°C until use.

Example II

Single Nucleotide Polymorphism Detection by Single Nucleotide Primer Extension (SNPE)

Single nucleotide polymorphisms are the most common form of genetic diversity and are thought to be direct and indirect markers of many human diseases. The following example shows the use of Single Nucleotide

Primer Extension (SNPE) to identify the presence of SNPs. The method of SNPE is the subject of US Patent 5,888,819 and more recently described in detail by Reynolds et al. in *DNA Markers: Protocols, Applications, and Overviews* (ed. G. Caetano-Anolles), pp. 199-211, Wiley-Liss, New York, NY (1997), both of which are herein incorporated by reference.

The amplification primers listed herein (Table 1, columns 1 and 2) were selected to amplify the corresponding SNP-containing oligo in column 4, forming a PCR amplified target nucleic acid such that the primers do not overlap the corresponding genotyping (SNPE) primer in column 3.

SNPE primers were designed to be complementary to the phosphorothioate-modified strand of the PCR product target nucleic acid and ending one nucleotide base short 3' to the polymorphic site to be interrogated as described (Reynolds et al., *supra*). Either DNA strand can be a target for the SNPE primer as long as the phosphorothioate-modified strand of the PCR product is the complementary strand.

All oligonucleotides were synthesized by standard phosphoramidite chemistry on a PE Biosystems 392/394 DNA Synthesizer using Glen Research (Sterling, VA) reagents. Tetraethylthiuram sulfide (TETD; PE Biosystems, Foster City, CA) was used for phosphorothioate modification as per manufacturer's instructions. All oligonucleotides were deprotected in concentrated ammonia and desalted using NAP5 or NAP25 gel filtration columns (Amersham Pharmacia Biotech, Piscataway, NJ) as per manufacturer's instructions.

Genomic DNA from genetically diverse human individuals purchased from the Coriell Institute for Medical Research (Camden, NJ) was the source of DNA for PCR amplifications. The DNA sample was diluted with sterile, distilled H_2O to a final concentration of 5 ng/µL before use.

PCR amplification of 10 ng of template genomic DNA was performed in 384-well plates under the following conditions: 10 mM Tris-HCl, pH 8.5, 50 mM KCl, 1.5 mM $MgCl_2$, 0.001% gelatin, 400 µM each of dATP, dCTP, dGTP, and dTTP, (from the 2x Master Mix) and 0.050 U/µL Platinum Taq (*Thermus aquaticus*) DNA polymerase, (LTI, Bethesda, MD) using 0.5 µM each primer concentration in a total volume of 5 µL. The PCR amplification was performed in a PTC-225 DNA Engine Tetrad thermocycler (MJ Research, Watertown, MA) using the following protocol: following a 2 minute denaturation step at 95°C thirty-five cycles were carried out, each consisting of denaturation (30 seconds at 94°C), annealing (2 minutes at 55°C), and extension (30 seconds at 72°C) steps. This was followed by a final extension step (1 min at 72°C) and hold (4°C).

Single stranded target nucleic acid DNA was prepared from the double-stranded PCR product by treatment with a 5'-3' DNA exonuclease. Briefly, 5 µL T7 gene 6 exonuclease (United States Biologicals, Swampscott, MA) in 0.5 M Tris-HCl, pH 7.5, 1 mM Dithiothreitol (DTT), and 0.01% acetylated Bovine Serum Albumin (BSA) was added to a final concentration of 0.45 U/µL and incubated for one hour at room temperature. The reaction was terminated by the addition of 5 µL of 3 x SNPE Salt (4.5M NaCl, 30 mM EDTA, and 3 mM cetyltrimethylammonium bromide (CTAB)). The DNA created

by PCR originating from the phosphorothioated primer is protected from nuclease digestion whereas the opposite strand with the unmodified primer is digested and hence will not interfere with the hybridizing strand to the immobilized genotyping (SNPE) primer.

The SNPE primer of interest was attached to a polystyrene 384-well plate (NUNC). Briefly, 20 µL aliquots of 0.25 µM SNPE oligonucleotide in 50 mM N,N-dimethyloctylamine hydrochloride, pH 7.0 (ODA; Segma-Aldrich, Milwaukee, WI) was added to each well and incubated overnight at 37°C. The plates were washed with TNTw (10 mM Tris-HCl, pH 7.5, 150 mM NaCl, 0.05% Tween-20) three times and once with 1xTE/ISOH (10 mM Tris-HCl, pH 7.5, 150 mM NaCl, 10% isopropanol). The plates were incubated upside down at 50°C for 30 minutes prior to storage in sealed pouch with dessicant. 15 µL of the exonuclease digestion product was added to the appropriate well and the single-stranded PCR product was allowed to hybridize for 30 minutes at room temperature. All wells were subsequently washed with TNTw three times.

An exonuclease (-) version of the Klenow Fragment of *E. coli* DNA Polymerase I (United States Biologicals, Swampscott, MA) was used for template-directed single nucleotide extension of the SNPE primer. Briefly, the enzyme was diluted in a buffer containing 10 mM Tris-HCl, pH 7.5, 5 mM DTT and 0.5 mg/mL BSA. The extension reaction was performed in 20mM Tris-HCl, pH 7.5, 10 mM $MgCl_2$, 25mM NaCl,10 mM $MnCl_2$, 15 mM Sodium Isocitrate, 1.5 µM each of the four 2', 3'-dideoxynucleoside 5'-triphosphates (ddNTPs), ddATP, ddCTP, ddTTP, ddGTP. Two of the ddNTPs were unlabeled, one was labeled with biotin, e.g. 2', 3'-dideoxyuridine 5'-triphosphate (biotin-ddUTP), and one labeled with

fluorescein, e.g. fluorescein-labeled 2', 3'-dideoxycytosine 5'-triphosphate (fluoresceinated-ddCTP). The determination of which labeled ddNTPs to use depends on the nucleotide identity of the presumed SNP. For example, a suspected C to T mutation can be assayed using a mix of ddATP, fluorescein-ddCTP, ddGTP, and biotin-ddUTP. The enzyme concentration was 0.02 U/μL and the reaction was performed at room temperature for 30 minutes. The plates were washed with TNTw three times, then 0.2N NaOH, and then three times with TNTw.

Detection of the extended primers was performed by standard ELISA techniques using two nucleotide-specific labeled antibody conjugates. The dilutions of each are determined empirically for each antibody lot to achieve approximately equal intensity for the two colorimetric signals in the presence of both alleles. Briefly, the wells were incubated for 30 minutes at room temperature with 10 μL of 1% fraction V BSA (Sigma, St. Louis, MO) in TNTw containing an alkaline phosphatase conjugate of antifluorescein (1:2000 dilution) (Boehringer Mannheim, Indianapolis, IN). After washing with TNTw six times, the presence of alkaline phosphatase was determined first by the addition of 25 μL per well of a 1.5 mg/mL solution of p-nitrophenyl phosphate (Moss, Pasadena, MD) in 100 mM diethanolamine, pH 9.5, 20 mM $MgCl_2$. The plate was immediately placed in a microplate reader (ICN, Costa Mesa, CA) and the development of color monitored spectrophotometrically at a wavelength of 405 nm after 24 minutes in an endpoint assay. Next, the detection of biotinylated-ddNTP was performed. The wells were incubated for 30 minutes at room temperature with 10 μL of 1% fraction V BSA in TNTw containing a horseradish peroxidase-conjugated antibiotin (1:500 dilution) (Zymed, San Francisco, CA). The plates were then washed three

times with TNTw and the presence of fluorescein was determined by the addition of 25 µL of a 1 mg/ml solution of tetramethylbenzidine (TMB; Moss, Pasadena, MD). The plate was immediately placed in a microplate reader and the development of color monitored spectrophotometrically at a wavelength of 620 nm after 24 minutes in an endpoint assay.

A scatterplot of the raw data of OD_{405} v. OD_{620} was used in the visual determination of sample genotypes. A polymorphism is identified when three distinct clusters are seen in the positive regions of the scatterplot. These correspond to individuals that are homozygous, forming one cluster that is positive for OD_{405} and another that is positive for OD_{620}, or heterozygous, forming a third cluster that is positive for OD_{405} and OD_{620}.

Figure 3 shows a scatterplot that was classified polymorphic. The PCR primers used were oligonucleotides of SEQ ID NOS:25 and 26 (Ref No. 261, Table 1). The SNPE primer used was an oligonucleotide with SEQ ID NO:27. The targeted nucleic acid with the suspected polymorphism contains the sequence of SEQ ID NO:28. SNPE was performed using fluorescein-ddCTP and biotin-ddUTP. The Y-axis corresponds to signal obtained from ddUTP incorporation and the X-axis corresponds to signal obtained from ddCTP incorporation. Note that there are clusters where each allele tested is positive (CC or TT) and where both alleles are positive (CT). This is an example where a SNP is identified. Note that there is another cluster about the origin which corresponds to no signal (NS) due to PCR failure.

Table 1 lists the invention oligonucleotides disclosed herein. Each row provides two PCR primers used

to amplify the target DNA comprising a certain SNP (Columns 1 and 2), one genotyping oligonucleotide (Column 3; referred to as a SNPE primer) used to probe the identity of the base at the location in the sequence corresponding to that SNP), and sequence of the region flanking the site of that SNP (Column 4). A "P" listed to the right of a PCR primer denotes a phosphorothioation of that primer at its 5' end. In this embodiment, such a phosphorothioation refers to the five most 5' nucleotides of one of the two PCR primers being linked by four exonuclease-resistant phosphorothioated linkages (e.g., 5' C-(p)-G-(p)-C-(p)-A-(p)-GTCTCAGGCCAGCT 3', for SEQ ID NO:2, where "-(p)-" represents a phosphorothioate linkage). While phosphorothioation sites are listed for the specific residues herein, it is understood that other modifications which confer exonuclease resistance can serve as equally desirable substitutes.

In this particular embodiment, nucleotides labeled as "X" refer to C3 linkers placed in the corresponding sequences at the location of the X. While C3 linkers are listed herein, it is understood that other single-nucleotide-spacers can serve as equally desirable substitutes.

The sequences of Table 1 are arranged in the same manner as the SEQ ID NOs are listed. Accordingly, the nucleic acids of SEQ ID NOs:1, 2, 3 and 4 correspond to the nucleic acids in Row 1, Columns 1, 2, 3 and 4, respectively. Similarly, the nucleic acids of SEQ ID NOs:5, 6, 7 and 8 correspond to the nucleic acids in Row

2, Columns 1, 2, 3 and 4, respectively. Therefore, a general formula can be established to describe the SEQ ID NO of each nucleic acid:

SEQ ID NO= (4 x (Row Number - 1)) + Column Number

Row#	REF#	1 Upper PCR primer	Modified	2 Lower PCR primer	Modified	3 GBA primer	4 Flanking sequence
			-		-		
1	255	TTGAAATGTGAATAGTAAACTATGTAGAGATGA		GGCAGTCTCAGGCCAGCT	P	CAGTATGGGAAAAAAGCAXCTCGGGAG	GTATGGGAAAAAAGCAGCTCGGGAGCTAGGGTGCTGAGCAGAGAAGAGTGA
2	256	CTCTTGGCTAGTTTATGTGAGATGAGA		AGCTTTCAATCCTTCCAAACTTG	P	TCCTACTTCATCACTTCTTCTATTA	TCCTACTTCATCACTTCTTCTATTACGACTAATGTCTTCTGATGTTTACCA
3	257	CTACTGACTGCTTGACTGAGCTAATTAAT		AATACATCAGAACCCCAAATCACA	P	GCTTGXCCTCTTGTCATAATCAGCC	GCTTGGCCTCTTGTCATAATCAGCCCGAGCGGGGATAGCTCACAAGACCAT
4	258	AGTTATTGCTTTCGTGAGGTGAAG	P	TCAAAGGAAAAGGTATGTGGAATATT		AAGTGCATCGGCCTTCAGAACGAGG	ATTTTGCTGTAGTAATCTGTTGCACACCTCGTTCTGAAGGCCGATGCACTT
5	259	ATCTCAATTCCACGTTTGCTCT	P	CATGGAGGGAAAATCCTTAACTTT		CTTTGCGAACAGAGGTCCCTGGAGG	AGGGGGAGCCTCAGCTCCACTGTCTCCCTCCAGGGACCTCTGTTCGCAAAG
6	260	AAGCAGCTCTGACTTTTGCAGT	P	CCCCTGGACCATAACTTCAGT		GTGTTXCACATAAAGTCAGCACATTTT	CTGACTTCAAGACGTCATTGATCTTAAAAATGTGCTGACTTTATGTGCAAC
7	261	GTGGATATAGTAATTATCAGACATGGACATTA		ATTTTATTGTTTTGTGGCTCTCAGTT	P	ATTTATTCAAGAAAXCAGATGATAAGA	TTATTCAAGAAATCAGATGATAAGACAGAGGACTTCAGCATAGAACTGAGA
8	262	CGAGCATCAGGTTATTGAAGC		CTAGGGAGTTAGCCCCGCT	P	CAGAGAGGCCTGTGAAGAGCTACCC	CAGAGAGGCCTGTGAAGAGCTACCCGTGGATGCAGTGAGTGTGGGGGTAGA
9	263	CAAGTGAGTAAGGGGGCTTG		CTCACATCAGCCTTCTCCATC	P	TTAGAACACTGGGGGATTTACCTTG	TTAGAACACTGGGGGATTTACCTTGCACTTTTTAAAAATAAGACTCATGAT
10	265	TGAAGGAAGGCGGCTGCA	P	GAAACTCTCTTTCCCACAAAGGA		CAXAGXAGGGTCTCCTTTTTCTACTCC	CAAATACTTTGAGTGCTGCATCTTTGGGAGTAGAAAAAGGAGACCCTCCTT
11	266	GTGGTGGAGTCAGGACATGAGTA	P	ACACCAAAGGGTTTTTGTGATAATC		AATGAGATAAGGGCTATXAAAAGTTTA	AATAACTTATTTTGCAAATATTGTACTAAACTTTTAATAGCCCTTATCTCA
12	267	TATTTGCCAAACCTTTCGC		GAAAAAAACCAAAGGGGTGC	P	AATACCACACTATTTGATTCCTGTA	AATACCACACTATTTGATTCCTGTAGCTTCAGAGTAAGTCTTGAAGTCAGG
13	269	AGTGAAAAGGATCRGTCACAGC	P	CATATAAATCAGGAGCAGAAWCAGAGA		CAGAGAAGGCCCCCAAACTCAGACA	AAAATGTTTCTGATGTGAATTTAAAGTGTCTGAGTTTGGGGGCCTTCTCTG
14	270	AGGATCRGTCACAGCAATAACTTAAG	P	AAACTCAGACAYTTTAAATTCACATCAGA		TTCACATCAGAAACATTTTGCCACT	AATGGACATATGTATCCTAAGAAGACAGTGGCAAAATGTTTCTGATGTGAA
15	271	ATGGTTTAAAAGTGTGTGGGACTTC		CATGGCAGAAGGTGAAGGG	P	ACTTTTGCTCACTCTCTCTCTCCTG	ACTTTTGCTCACTCTCTCTCCTGCCACCATGTGAATAAAGTGTTTGCTT
16	272	TGACTGGCAGATTGACAAAGAA		CTATGGCGCTGCATGGCA	P	AGTCXTCTAAATGCATGAGGGTGAAGC	TCTTCTAAATGCATGAGGGTGAAGCGTGGGAACTGCTGTAACAGGCCCCAT
17	273	TGTACCTGCTTGTCATATGCTGAT	P	GTTACTGATGGAGGGGTGGATATAC		ATAGATGGATGGATGGATAGATGGA	CATTCACCTGTCTTTCTATCCTTCCGTCCATCTATCCATCCATCCATCTAT
18	274	GAACTTGATTTCCTATGTGAACCTTATATT		TCTATTACTATTTATGCACTGGAATACTTCTATAA	P	TTCATTTACAGTAATTTTACAGTTGATGGGGGAATATATTTTTTATAGAAGTA	CATTTAGAGTAATTTTACAGTTGATGGGGGAATATATTTTTTATAGAAGTA
19	275	AAATTTGGGTGGGGACACA	P	CTAAGATATGGAGCAGGTACCCC		ATGCAAACCCTCCACAACAACAAAA	ACCGTATCACTTAACAATGTATGCAGTTTTGTTGTTGTGGAGGGTTTGCAT
20	276	GTGGAACAGAATAGAGAGACCAGAAA	P	TGCAAGTGTGTGTCCAATAGTTCT		TTGTTCCATTGTATTGTGCCTTTTC	AATGTAAATATAACCAAGTGATCTTCGAAAAGGCACAATACAATGGAACAA
21	277	ATATAATCATTCAGCAGATATTTATCGATTG	P	GCTGGATCAGGGCTCCTT		TTGGGTGCCCACTAGCCTTGCCTTT	TAATAAGAATAAAGGAGGCTGTGATCAAAGGCAAGGCTAGTGGGCACCCAA
22	278	TCCTATGATCTTAAACTTCCCTGTACC	P	CAATGAAATGGGTATGAAAGTGCT		GTGCTGTATGATGXCACTTCTGGGCGT	CTCTGGATTTGAGGTTTGCATGGGTCACGCCCAGAAGTGGCATCATACAGC
23	279	GGGTTTACATTTGTGCTTAATCAATAT	P	TGGGAATAGATACGCCCACA		ATTCAGAATTTACTXCTACAGCACAAT	CAGCATATGTTGTTTAAATATAATTGATTGTGCTGTAGCAGTAAATTCTGA
24	280	GATCCTACTTTGGGACCAGGT	P	CCAGGAGTGGAAGAGATCGC		GAATTTTTTXATTGATTATACACTATA	TCTATTGTACCCTCCCATGAAGCCAGTATAGTGTATAATCAATTAAAAAAT
25	281	CTAGTTCTTTTGGAAAAGATAAGCCAA		TCTTCACCCTAGTTTGCACAATTC	P	CATGACTCTTAAGTGGATGAAAGTT	CATGACTCTTAAGTGGATGAAAGTTGAGTGTGCAGATGTCTGCATGAATTG
26	282	ATTAAGTGCCTCACGTAATACTGGG		CTTCGGCCTTCTCAGGGC	P	TGGGACGCTGGAGAGACACAAGGAA	TGGGACGCTGGAGAGACACAAGGAAACCCAAGATTATTTACTAGCCTTAAT
27	283	TGGGGTTACAGAAACTTACCATTACA	P	ACCACTGCACTCCAGCCTG		AAGTGTGACTCCGTCTCAAAAAAAA	AAAGATGTTTTATTGTTTTTTTTTGGTTTTTTTTGAGACGGAGTCACACTT
28	284	TGTGACTGGCTAAATCACTTTGAG	P	CCAGATGGATTTTCTGCACC		CACXAGGACTTGAAGTCTTGGAACATC	TGCAAGACTAGAGTGCTTCCAGCACAGATGTTCCAAGACTTCAAGTCCTGG
29	285	AGCAACCAAAAAAAAAAATGTGTAGA		CTAAGAATGGAAATCCTGCCCT	P	AGGAAAAGCAAACGGATATTGTCTG	AGGAAAAGCAAACGGATATTGTCTGCGTGTAGAGCCGTGGGGCCACTAGGG
30	286	CTGGGGCAGAGGCTAAACA		CAAAATACACATACCTTTCCCAGTAAC	P	TTGTTGCTTCAAGCCAAGAACCTTA	TTGTTGCTTCAAGCCAAGAACCTTACGGCTGGGTGAAAATTCAAGACTCTG
31	287	CCATTTCATGTGCTAAAAACCAG	P	TTTTGGAATTTTTCATAGTGTTCCC		TGTTCCCAAACTTGAYACTCATAGG	ATCAAAGTAAAACCTGTTACAAATAGCCTATGAGTRTCAAGTTTGGGAACA
32	288	TCAGCCATGATTGTGAGGC		TGCTATAAAGACATACCCAAGACTGG	P	ATGTGGAACTGTGAGTCAXTTAAACCT	GTGGAACTGTGAGTCAATTAAACCTCTTTTCTTTATAAATTACCCAGTCTT
33	289	CTCACCACCTACAACTTGRTATTTAGC	P	GTATTTCTCATCTAAATGAAAGCACATTTT		AAAGCACATTTTTAAGAGAGAAAGA	ACTTTAATATTTCTATATCTTACACGTCTTTCTCTCTTAAAAATGTGCTTT
34	290	CAGAAAAATAGAAGCAATAGGACAGAC		ATATGGTGGGTGGGACTTAGC	P	CTATAGATACAGATGATATTTATTA	CTATAGATACAGATGATATTTATTACGGGAATTGGCTCATGTGATTATGGA
35	291	ACCTCATGCATTACAAGGCTCTT		GAAAGTTGGCAGGTACAAGGTCT	P	TCTGGTTGCACCXCCATXCCCTGGGCA	TGGTTGCACCCCCATCCCCTGGGCACGTGAGAAATTCATGAGCCCCATTCT
36	292	GCTACCATCTTCTTTGGCTATCATT	P	TCAATGTTATCGATCAATGTGTCATAG		AATGCXCAAATGGTATGAGTGTGTGTT	GAAAATGCTCTATTCATTAAAACACAAACACACTCATACCATTTGAGCA
37	293	GGGCTTCAGCAAAATACAGGT	P	CCGGGGATCTGAGTGACA		TGGTAAAAAAXGATTTCATTGTGATTA	TGAAAGAGACATCAAAAATTTTAACGTAATCACAATGAAATCATTTTTTAC
38	294	ATTCAGTCCAGGGCTGGG	P	GCCATCTAGCATGAACACATAGC		ATAGCCATGAGCCATCAATGAGTCC	GTCACTGGGAAAGACAACCTCCAGCCGGACTCATTGATGGCTCATGGCTAT
39	295	CTTCAAGCCTCCACTACATCCTC		AGGTAGGAGAAACATGAGAGTTTTTTTAA	P	TCCAATTTCTTGATAAACATGCAAC	TCCAATTTCTTGATAAACATGCAACGTATTTTTTTCTGAGAAAATAGAAGC
40	296	CATGGGGAGAGAGAATCTAGTAAGTG	P	TCCAGAGGCAGTTCAGAATAAAAA		AAAAAAATXATGTGTTGATTAGAGACT	AACAAATATGTGTCTGTAGCTGCAGGAGTCTCTAATCAACACATTATTTTT
41	297	GCATCTTGTTTTGAGATTCCATG	P	AGAGGGAATGATCAGTCAGGG		GGGAAATTCATCTXTAGACATTCATTA	GGAAAGTGACAAATTGCAAGGAAACGTAATGAATGTCTATAGATGAATTTC
42	298	CTCACAGCACCTCAGCACC		GTATACCAGGCAAGGTAGAGAAAGG	P	AAACCCCCTCTATCCTCAGTGTGTC	AAACCCCCTCTATCCTCAGTGTGTCCCCCAAAATAAGAAAAAAATGTTTTAT
43	299	AGCACCTAAACCCCCTCTATCC	P	CTGGGAATGGAAGAAAGCAGA		CAGACTTTTAAGXATGTTTGCCTCATA	GAAAAAATGTTTTATAATGAGCACACTATGAGGCAAACATGCTTAAAAGTC
44	300	TACAGGGGATTTTGGATCTTTGT	P	GTTTAATCCTCAGAACAATCTCTCCTACT		GGCAGAAGTGGCCCTATXAAGACACAT	AGCTTATCTCCCACTTTCTGGCATGCATGTGTCTTAATAGGGCCACTTCTG
45	301	TTGATCTTACTCAGCTCTCTTCAGAG		ACCCTGATTACAAGGGTTATAAAGAAG	P	AGATCCAGCTTAGATTCCCATTCCA	AGATCCAGCTTAGATTCCCATTCCACCTGCTGTCTCAGTATTCTTCTTTTAT
46	302	TTAAAATGCAGACACTTCTTAATATATCGG	P	TTTTAAGATTTTCAGAGGCAGGTTC		CAGGTTCTGAATAGCCTTTGGTCTA	TCTCAGTCATGAGGCTAAATTAGCCGTAGACCAAAGGCTATTCAGAACCTG
47	303	AATAGAACAAAGGAAGTTTGATGTGG		GAAATGACTTGCGTAGGCCA	P	AACCCXTTAGCAAGACAAAGATTTCTG	CCCTTTAGCAAGACAAAGATTTCTGGACGTGAGTCTGCCACTAAGTAGCCG
48	304	AATTGAGGATCTAGAACAGCCCC		GTTTGATTCCACATGTAGAAAGGATG	P	CTAXTCCXACCGCAGAGTGGACTTGGT	AGTCCCACCGCAGAGTGGACTTGGTCTCCTGGCCAATTGCAGGCAATGAAA
49	305	CTCCTATGTCTGGGAATTAATAGTAAGAAA		TCAATAACACATTTGCCTAAGTTCCT	P	ATTTTAAATGAGTATTGATGCAATA	ATTTTAAATGAGTATTGATGCAATAGTTGTTATGGAATATATTAAGGAACT

Row#	REF#	1 Upper PCR primer	Modified	2 Lower PCR primer	Modified	3 GBA primer	4 Flanking sequence
50	306	TAAGGTGGGCACTGAGCATG	P	GAATGTGCCRTTTTATTACATAGGTATACA		CCACGXTGGTTTGGGGXTCACCTCTTT	AGCCCACCTAAGAGARGAATCATGGGAAAGAGGTGATCCCCAAACCACCGT
51	307	TACCAGAAAAGTGGGACATTCCT		CTTCTGAGCCCTCCAAACTGT	P	TGAAGATACCTGAAAATGTGGAAGC	TGAAGATACCTGAAAATGTGGAAGCAGCTTTAAAATTGGGTAAGGAGCAGA
52	308	TTTGATGTTTGTGACCACTGCT	P	CTATTGAATTGAACATATTTTATGGCTTC		TGGCTTCGTGGCTTTGTGACCTTGT	TTCCCACAGGTTGCTGTTTGACCACGACAAGGTCACAAAGCCACGAAGCCA
53	310	AAATATACAGACACAGTGGTTACTGGTG		GTGATGGGATTATAGGCATGAGC	P	GGGGAGGTAGAACAGAGGATACAAA	GGGGAGGTAGAACAGAGGATACAAAGTAGCAGATATAAGGCACTGTGGCTC
54	311	GTGGGACCTAATTAAACTAAAGAGCTTC		TGTCTGATGCACAGTTTGAAAATATT	P	CAAAATAAACTACCAACAGAGTAAA	CAAAATAAACTACCAACAGAGTAAACAGACAACCCACAGAATGGGAGGAAA
55	312	TTTTCACTCATATGGGAAAGCTAAAC	P	CAATTAACCTTCTCCTCTCTCTCCC		CTCTCCCCTCTCCCCACCATCCTTC	GTAGATTGATGGTTACCAGAGGCTAGGAAGGATGGTGGGGAGAGGGGAGAG
56	313	GGCCACACATGATTCTTTACATG	P	TGATCTGTACACATCCTGGGTTC		TGCCTGGAATTGATTTTTGTATATA	ATATGAGAAAAATTTAAAATCAATTGTATATACAAAAATCAATTCCAGGCA
57	314	GCCAGATGCCTTCCTTAGTAACTT		GTGAAATAGTAAATAGTTAGACTAAGATGAATGCA	P	GAATTTTGCGCTGATTATAGAGTGT	GAATTTTGCGCTGATTATAGAGTGTGGAATTGATTGCATTCATCTTAGTCT
58	315	CTTGCAGTAAAGAAGAGCTTTGTAAAG		TCTACTGGAGAGCGTTGTTCTGT	P	GCTTGATGTCTTAGTTACTTTCATT	GCTTGATGTCTTAGTTACTTTCATTGTTGGATCTCAGTTTTCTGAGCACAG
59	316	TTGCCACCTGGACACTTTG	P	AGTCTGGGTCAATCACCCC		CAGCCAACACTGTAACTCCTTTCTT	CTCTTCCTTCCTTTAAATCAACAGGGAAGAAAGGAGTTACAGTGTTGGCTG
60	317	AGAAATTCAAGCCTGCTGCA		CTCCTACAACAAAAACACACTTAAGCA	P	TTAACTGGTTGTTTTGTAGATTTTA	TTAACTGGTTGTTTTGTAGATTTTACTGTATATTGCTTTATATTGTCTGTA
61	318	TCCTTAAAAGGAAAGCTCCCAG		CTGCTGGGTACACAGGGTG	P	ATCATTAGCCAGTGTTTATTTGGCCC	ATCATTAGCCAGTGTTTATTTGGCCGCAGGGCAGGAGCAGGCCCTATACTG
62	319	CTTGTATGAGGAAGATTCTGGGTTAC	P	CAGTACAGCAATAAAAACTGTTCTGG		CAGGTCCACCACAGAGTCTCATTCT	CTGAGTTCAGTCCAGACATAACAGCGAGAATGAGACTCTGTGGTGGACCTG
63	320	TTATTCTACCAAAAAGACATATGCACTTG		CTAATAATACTGTGTGGATGTACCACATTT	P	GAGTCAGCCTAGGTGCCCATCAACA	GAGTCAGCCTAGGTGCCCATCAACAGTGGATTGGATCAATAAAATGTGGTA
64	321	AGAAGTACTGGGATGATCTTTGGG		GCAAAGAGCGAAAGAACAAGC	P	TGATGAAAGAGAGTTGACTTGGGGG	TGATGAAAGAGAGTTGACTTGGGGGGCAACCTGCTCGGGTCCCCTTCCATT
65	322	CCGGGGATCTCAAAAACCT	P	GGAACAGGATGGATATTTTGGG		TTTTTAAGTTTGTAGGACTGTTTGT	GCAGTTTAGAGGTCCTTAATGAATCGACAAACAGTCCTACAAACTTAAAAA
66	323	GTGTTCCAAGAACTTTATCAGCATC	P	AGTTTTTGTTTCCTGATTCATAGTGG		AGTGGGACTAATAATACTTAACCTC	TCATTATGCTGCCACTAGAACTTAAGGAGGTTAAGTATTATTAGTCCCACT
67	324	AAATCTTATTCCTCCCCCTCATG		CTTATGCCTAGTTTCTTCTCCTAGTTTCA	P	ACTATTAGTGATTCCAGACTTCATTGTCTCCCCTAGGTGGGAATGATTTAT	
68	325	TTCGTGTTTTACAAAGCATGAGC		ATTCTGATGCTGCTTCAGTTTGA	P	GGAAGCATGAGGTTGTCCAAGCAGG	GGAAGCATGAGGTTGTCCAAGCAGGCCCTGGGGCCAGGACAGAAGAGAGGT
69	326	GTTCCCTGTTAGAATACACCCACC	P	AGACCTGGTTCATACTGATTGATAGC		TAATTTAAAAGGAAAAGACTCAAAC	AATCAACAGGGAAATATTACACCTAAGTTTGAGTCTTTTCCTTTTAAATTA
70	327	CATATCGCTGAAGTGAAAGTCAGG		CAAAAAGCTCAACGAAATTTGG	P	CTCXAAGXAATGGAATGGGGATATTTC	CCAAGAAATGGAATGGGGATATTTCGGTTGGCTCAGATGAATCTGAGAATC
71	328	CTGGATGTGTTTCAAACAGTGAGA	P	AGAGGGCAAGAAGGAACACAG		CAGAATATTTGAGAGAGTAGGAAAA	AAAGAGGCAGTATCCATGAGCCTGAATTTTCCTACTCTCTCAAATATTCTG
72	329	TGGTCTTGAACTCCTGGGC		CAATAAGAAAATGAACAACTCAACTTAAAAG	P	CAAGTGATCCTTCTGCCTCAGCCTC	CAAGTGATCCTTCTGCCTCAGCCTCCCAAAGTACTGGGATTGCAGCATGAG
73	330	CTGTCTTTTTTTCTAATCAGTTTCCTTC		ATTTGGCGTTTGATAATCCTCA	P	ATAATTGATATCAGATGAACACAAA	ATAATTGATATCAGATGAACACAAAGCACATAGAACCTGATGTTTCTGAG
74	331	ATCTAATGCTTACCATGTCTTCATGG	P	CCTTGGTATGTTCACAAACCTTTG		GCCTGCCCTGTAGGACTTACCTGAC	GGCTACTCAACGTCTGATTTGATAGGGTCAGGTAAGTCCTACAGGGCAGGC
75	332	TGGAGTAAGTAGGGGTTGCACA	P	AATAAATTATTTGGATAGCCAAACTTGG		AAAGGTGTTTCCACCATTGATGATT	CAAGGCATCTTTACCCTTGATGATAGAATCATCAATGGTGGAAACACCTTT
76	333	CCAGGTGACCAGGCCCCA		GGCAATTGATGGGCAAGTG	P	XCTAGCAXCCCAAGCAGAGGCAGCA	CCTAGCAGCCCAAGCAGAGGCAGCACTCCCTCCCCTGCAAGAACAGCCTGC
77	334	TTGGAACTGACTAACAGGCCA	P	CAACTATTTAACCAGTCGCCAAAA		TTCACGTTCCAAACTTTCCCCGACT	TTGGAAGGCTTGGAAGAAGACTCAAAAGTCGGGGAAAGTTTGGAACGTGAA
78	335	ATCTCTGCACTCTCATGTTCATTT	P	GTGTGTGTGTGTGTGCGC		CTGTCAATGTATGTTTAGTTTGTTT	AGCATTACTGTAATAGCCAAATATGGAAACAAACTAAACATACATTGACAG
79	336	GTAATATCATTAGGCACCCAACTAACAT		GGAGAGATGTGAGGTTTGAATTTC	P	GTCAGAACTGTATGTTGATACTTGC	GTCAGAACTGTATGTTGATACTTGCCTTCAGACAGTAAAACTAATTTGAAA
80	337	ACTGCCAGTGGGTTGTTGAA		TAAAGGGTAAAATCCAACAAGAACAC	P	TTGATGTTCCAGTGTTGGGTGCATA	TTGATGTTCCAGTGTTGGGTGCATAGAAATTTAGGTATTTAGGCTAGTTAA
81	338	CCGGGGATCTGACTATCTTGT	P	CATAACATGGACACTGAGTATAATATCTCC		TACAGTCCATCAGTGAAATAATATG	ATACATATTTAGGGACTTTTAACACGCATATTATTTCACTGATGGACTGTA
82	339	ATCTAGAAATAGAACAGCCTGAATCTGTAA	P	GAATGGGAGTACTAGCCATCACC		ACTGGATCTCTATCTTCTXAACAGCCT	GTCAGTTGACAGCAGCTGCATTACGAAGGCTGTTAAGAAGATAGAGATCCA
83	340	AGTGAGTGAGGTGCGCTACAG	P	CAATGGCAGTATTGGTGTTATGC		ACTTGACTGCAGGTTCATTGAGGGC	AACACAGTTGAAAAGAATCTGACTTCGCCCTCAATGAACCTGCAGTCAAGT
84	341	CGGGGATCTTTCTTAAAACCAT	P	GTAAAATGATTAGATGTACTATTTAAGGAGTGACT		CTCCGAAATAAGCAGAAAACTAACA	TATCTATGATAATTTGGAGACAAACGTGTTAGTTTTCTGCTTATTTCGGAG
85	342	CAACATGGTGAAACCCCATC		CACCTCCCAGGTTCAAGAGAT	P	AAAATTAGCTTGGCGTAGTGGTGGG	AAAATTAGCTTGGCGTAGTGGTGGGCGCCTGTAATCCCAGCTACTCAGGAG
86	343	TCACTAAGACAGTCACAGTCAATTAAA		TTGGTTCAGTATTATAAATTGTTATTGGAAG	P	ACTTAAAAAAAGAGAAACAAAAGGA	ACTTAAAAAAAGAGAAACAAAAGGACCTGTCAGGACAGCTTCCAATAACAA
87	344	TCCCATGCTCTCTGTTTCC		GGGTTTGGGACTCCAGGA	P	CTGGGAAGCCAAGXTCATCAAGATCAT	GGGAAGCCAAGATCATCAAGATCATAGTCTTCTTTTGCTCACAGCACACCC
88	345	TTATATAAAATTCTGGATACAGGCTCCC		CCTACCACTTTCCTCATAAGCCA	P	GCAGGCCTTGAAAATGGAAGTTTAC	GCAGGCCTTGAAAATGGAAGTTTACCATTTTCAACGGAAAGAAGGCTGGCT
89	346	CTGAATAGAGATTGGGGAAAAAGAA		TTATATAACTCTTTCTCATTTTTCTGGCTTT	P	GGCAATTGGGGGTGGTCTGGAGAGG	GGCAATTGGGGGTGGTCTGGAGAGGGTACATTTAAACCAAAGCCAGAAAAA
90	347	GCCCTGGGAAGAAAGACAAC	P	TTTTTCCCCAATCTCTATTCAGTTAC		TCAGTTACCCTTTCTTATTTCTTCA	GTAATTTTAGTTTGTGGTAAGTACAGTGAAGAAATAAGAAAGGGTAACTGA
91	348	AAACTGTTCTTGGACTCAGGCA	P	CATTTAATCTGCATGACAATCCC		AGCCTGTGCCAGTCTXAAACTTGCCTA	ACCCAACACATAATCTGGCACCTTCCTAGGCAAGTTTAAGACTGGCACAGG
92	349	GAGGACACATACTGTCATTGGATG		TGTACTTAGCATACAAATCTCTAGGATGATT	P	ACAAGCCAAATATGTTACTAGAAGT	ACAAGCCAAATATGTTACTAGAAGTAATTAATCTATTCATTCAAATCATCC
93	350	CCRTATTTCTAACAGGAAAATAGTCATTTTA	P	AGCTCCCCATACCTGTTTGC		AGCTGTATAATAGAGTGTCTCATAC	TAAAGGTCTGATTTTTTACAAAGTGCGTATGAGACACTCTATTATACAGCT
94	351	GAAACTAATGAGAACAAACACACAACAT	P	TTTTGATGTGAACATTTAGTGCTATAA		GCTATAAATTTCTCTCCTAACACTG	CCAGAATCTCTGGGACACAGCTAAGGCAGTGTTAGGAGAGAAATTTATAGC
95	352	GTGAAGATCGAATACCTAAAATTATCTTATTTAC	P	AGGTTTTGTTCCAACTCCAAGG		TGGAGATTAACTCTTCACTGACTTC	ACATAGGTTAAGTTCATGCTTTCAGGGAAGTCAGTGAAGAGTTAATCTCCA
96	353	GCGGGATCTCTACAAGGAGAA	P	GTATTTTGATGGGAATTGCATTG		TKTTTCCTTTTTTGTGTGTTTCATC	ACAMACCACTGCTGAAAGAAATCACCGATGAAACACACAAAAAAGGAAAMA
97	354	GCTGAAAGAAATCACYGATGAAAC	P	TGTATGCATTGCTTTGGGC		CAATATGGTCCTTTTCACAATGATT	AACATCCCATGCTCATGAATTGGAAGAATCATTGTGAAAAGGACCATATTG
98	355	TCTGCTCACTCCAATTCTGGG		GATTCCAGGCTGTCAGCTCC	P	CGAAAATTATTTCAGTCACATTGTT	CGAAAATTATTTCAGTCACATTGTTCGTAGCAACCATATTTTAAAGCACAG

Row#	REF#	1 Upper PCR primer	Modified	2 Lower PCR primer	Modified	3 GBA primer	4 Flanking sequence
99	356	TGAGGCAGGAGAATCACTTGA		TTTTTTTTTTGAGATGGAGTCTTGC	P	ACCCAGGAGGTGGAGGTTXCAGTGAGC	CCAGGAGGTGGAGGTTGCAGTGAGCAGAATTCACACCACTTCATTCCAGCC
100	357	AATGGGCGCACTGCTGAG	P	CCTCATTTGTAAAACTGGCAAGTAA		CAGAACCCAATGCATAGTGTTATTC	ATAGGAATCTCTTCAATTAGTCCTCGGAATAACACTATGCATTGGGTTCTG
101	358	TTAGGGCAAGGATAAGCCAGTAT	P	GTCTATAGCAGGTCAAATAWCTAGGCC		GCCTAATCTTAGCCAGAGGGACCAG	GCTGTATTTGTTCCTTGCTGAGGGCCCTGGTCCCTCTGGCTAAGATTAGGC
102	359	TTGGCTTACTGCAATCTCTACCTC	P	GACCAACATGGAGAAACCCC		CCATCTCCACTAAAAAAAAAAAAAA	ACCACCATACCTGGCTAACTTTTTTCTTTTTTTTTTTTTTAGTGGAGATGG
103	360	TTAAATGTTTATTGGCTGTCTTCACC	P	AAATGTAGACATGCATTCACTTAGGAA		ACTTAGGAAATATTTATGAACATGA	CCCTATCAGAACTCCCAGCATGTAGGTCATGTTCATAAATATTTCCTAAGT
104	361	TAATATCCTGATGAATGAAGATGGCTA	P	CAATTAGCTCTGAAGAGTCAGCCT		CCAGATACTGACCTCCTATGAAAGT	CCTCATACCAGAAGATGCCATCAAGGACTTTCATAGGAGGTCAGTATCTGG
105	363	GAATTATTTTCTTTGCACTGTTAGGACA	P	CATAGTCATTTGGGGAACTGATATTG		TTGTTXGAGXTTAAAAATCCAGCAAAA	ATCAAATGCCTAACAATTGGTAGTACTTTTGCTGGATTTTTAATCTCCAAC
106	364	TGCAAAGAAGATTTTTGAATCCC	P	GACTGGGTAATTTATGAAGAAAAGAGTTT		CAGGAAGCATTACTGGGAGGCATCA	TCACCTTCGGCCATCATTGTGTGTCCTGATGCCTCCCAGTAATGCTTCCTG
107	365	ACCACCATGTCTGGTTAAGTTTTTAA	P	CATAATTCCAGCAACTCAGGAGG		GGCTGAGGCAGGAGGATAGCTTGAT	TCCCAAGGTAGTCTCAAATTCTTGGGATCAAGCTATCCTCCTGCCTCAGCC
108	366	TACGTAATCATTATTTTTCACAGGCTG	P	GTCTTGGTCTCAAAGTAACCCAAA		CXCAAAXCTTCCACCTGCCAAGGATGG	GGTGGCGGGATTAGCCTGACGCCACCCCATCCTTGGCAGGTGGAAGGTTTG
109	367	CTAGGCATGTCAAGTTCTTCATGG	P	CTTTATTCCTCCCTACCCTCATTG		CTAATGATGAGGGCCAXTTCTCCTTGA	AGGAGAGAAGAGGGGTCTTCATTTTGTCAAGGAGAATTGGCCCTCATCATT
110	368	AAAATGCCCTGTCTAGAGGGAG		CTAATCTCATTCCTCCTTTCTTCCTT	P	GCGCTGTGGGAATGTAGACTTCTTG	GCGCTGTGGGAATGTAGACTTCTTGGGGAAGATTTCCGAGTTGAGTAAGAA
111	369	TCCTCATTACATTTTAATGGCACTG		TGCCCTGTCTCACCTGCA	P	AGTTACAAAATGAAAAAGACTAAAT	AGTTACAAAATGAAAAAGACTAAATGTTAGTAGAGTTCAGAAATCTGTGGC
112	370	TTGTGAGGCAACCCCAGTATAC	P	CTATACAGTGCTACTCTACTCACACCCA		AGCTCCCCACCCGCACACACACACA	AGTTTCTTGATGACTTTGAGTGTCAGTGTGTGTGTGTGCGGGTGGGGAGCT
113	371	TATGGWAGTGAAAGCAGAGTCTGG	P	CCAGATATGACYCCCCTCC		TCCCCTGCTCAACXACTTGTTATGGCT	TCCATTTTAACCCAAAGGCAATGGGGAGCCATAACAAGTGGTTGAGCAGGG
114	372	CAGTTGTTGGAAACACTATTATTTAATGTACTAT		GCAGAAGGATCTAACAGATGAATTTG	P	CCAATGAATTTACGGCACACTATCC	CCAATGAATTTACGGCACACTATCCGCTCTAATCTAAATTTTTGTGTATCC
115	373	CGGGGATCTGAAAAAAAAATTC		AGAGCCAGCATTGTCTCACTTG	P	ACTTTATAAATGATTTCACTGCATC	ACTTTATAAATGATTTCACTGCATCCCCCAAAATTCAATCCCTAATTTACA
116	374	TCCCAGATAGTTCCAGAGACTTCA	P	CTTTAGCTTCAAGTTCAGAAGATGACTT		CTTTTTACTATGTTTTTGTCCTCCC	ATGAGCACATGTGAGTGTATATGGGAGGGAGGACAAAAACATAGTAAAAAG
117	375	TCACAGAAAGATACTGGAGAGGGT		CAAACCCCTAAGCCCACCTA	P	ACTTTGGGAGGAGTTTGGGGCTGTG	ACTTTGGGAGGAGTTTGGGGCTGTGCGAGGGTGACTCATTTTTACCTATGT
118	376	AGACTTGTTGATGGCTTTGACC		CTAGGGCAAAATGCCACTAGTTT	P	GATGAGGAACTTGTTGGGAACTGGA	GATGAGGAACTTGTTGGGAACTGGAGTAAAAGTCACTCTTGCTAGGCAAAG
119	377	TATCAGTCTCTTGAGCTATGGGG	P	CCGAGGAGGGACCTTCAA		AGAGCTCCAXATCCAGCCTCATTTCAC	GGTTCCAGGGCTCAGCTTCTTCATCCGTGAAATGAGGCTGGATTTGGAGCT
120	378	CTCCTGGTGTGGGCTTCTG	P	ATCTTGGCATTGAGAACAAGAAGA		GAAGAACCAGGAGCCAAGGTGTGTA	AATGGCAGAGGGAAACCTCACCCAGGTACACACCTTGGCTCCTGGTTCTTC
121	379	CAGATTCACAGACTAGAAAGGGAGTT	P	ATCGAATTGAGAAGTAAATCGTGTG		TCGTGTGCATGTACCTGTGTGTGTG	TCAGTAAAGTTAACCACACTCACACGCACACACACAGGTACATGCACACGA
122	381	TTTTTRGTTTGAGGCTTTTATAGCTG		GCAACGCTGAGGGGAAAA	P	GCTAAAGATGTGCCTCAAGACACCC	GCTAAAGATGTGCCTCAAGACACCCCGATGTTAGATGCCTTTCCCAACACA
123	382	AGATGATGTGAGCTAAGGGAAGTCT	P	CTCTGTACTTATTATTCTCTCTACCTGGGA		TAATCTCTCTGCCCTATTCTCTTTC	GAAGATGTGTAGAAACTACACAAGAGGAAAGAGAATAGGGCAGAGAGATTA
124	383	AAGACAGGGAATGTTTCTCTTATTTCTC	P	GTGAGTCATGTCCAGATGAAAATTT		GAATTAXCAGACTCTTGCTXCATCCAG	GAGTTCTGGTCTTAATTATGCCTCACCTGGATGCAGCAAGAGTCTGCTAAT
125	384	CATGGAGACACCGGGTGG	P	CGAGAGATCTTTCAATTTCTGTTTG		AATGACTACTGTATCCAGGCTTGAC	ATGGGCTGCAGGCATACATTCTGAACGTCAAGCCTGGATACAGTAGTCATT
126	385	GGGGATCTCAAAAAAGAAAAAAAA	P	GATCTCAGCTCACTATATCCTCTGC		AGTGATTCTCCTACCTCAGCTTCCC	GCATGTACCTGTAATCCCAGCTACTCGGGAAGCTGAGGTAGGAGAATCACT
127	386	TATTTCCCCAAATTATCRTAACTCCA	P	CAAAAGAAAGAGTGCAGCGG		CCCTTTACAAGCCAACTCTTCGTCT	CTTCTGTGGATTCCAGAGAGTAAGAGAGACGAAGAGTTGGCTTGTAAAGGG
128	387	CGGGGATCAGCCATTCAA		TGAAAGTGGTCCTATCCACTGTG	P	ATTGAAAATATTATTATGTGAGGGC	ATTGAAAATATTATTATGTGAGGGCCGAAAAAGATGCAATCTGTACTCTCA
129	388	ATACTGTGAAAGATATGAGACTCTTGGG	P	CTTAAGAACTGGTCAAGAAAATCATGA		AAATCATGACACTCTGGCTATACTG	GGATGGCGTGATACTCACAGCAACGGCAGTATAGCCAGAGTGTCATGATTT
130	389	ACACAGTGGGCMTGCTGT	P	AACAGAAAGGAACTCAGAATAAGCC		GTATTAAGTXTAXATAGATTTTTTTTT	AATCCCAGGCTTTACTGGCAATAGTGAAAAAAAAATCTATTTAGACTTAAT
131	390	TTCGTGATACTTATTTAAAAGCATCTTTG	P	AGACATAGGACACAGACTGAATTTCC		AAAAATAATACGXTACACCAATATCAA	GGTGATAAAAACATTAAGAAATATTATTGATATTGGTGTATCGTATTATTT
132	391	TATCGTATTATTTTTCCAGGGGATTC	P	ATTCAACAGTGAAGACAACTTTCACC		ATGCTTATCTCTTGACTTCTTAAAA	GGATTTCTGAATATATTTTTAAATGGTTTTAAGAAGTCAAGAGATAAGCAT
133	392	AGTAGCTAAGACTACAGGCATGTGC		CTAATACCAGTGCTTTGGGAGG	P	TTTTGTAGAGAAAGGGTCTTGCTAT	TTTTGTAGAGAAAGGGTCTTGCTATGTTGCCCAGGCTTGTTTCAAACTCCT
134	393	GTGACTCTTAGTGTGTAACAAAGTGCA	P	TACCTGCATAATAGAGCTTCAGTAAAAAC		CXTCXGTAAAAACTATGGACACTGAAG	AGTATTACCATAGAAGCTTGCCTGAGCTTCAGTGTCCATAGTTTTTACTGA
135	394	CCCAAGTGTTACCCAAAACATACTAA	P	TCATGGATGCTGGGAGTTG		GGTGTTCCTAGTTAYGGTTGCCAGT	GGCATTCTTATGTTTTTATTTGCTAGACTGGCAACCRTAACTAGGAACACC
136	395	AATGTCAAATTTAAGTGGGCATTCT	P	CTTCTTTGGCTTTGAGTCTGCA		GCTGGGAGTTGGGTGTTCCTAGTTA	GTTTTTATTTGCTARACTGGCAACCGTAACTAGGAACACCCAACTCCCAGC
137	396	AATGGGAATCTTAGTGAGTTTGTTTCT		GATTGGTTTCCAGAGGCATATTG	P	TCTCTAACTGGGCCATCTAATCCTG	TCTCTAACTGGGCCATCTAATCCTGCGCTTCCAGGTGTTCCTGGGGAGAGG
138	397	TTCGCAAGAGTGAGGGCTC	P	ATTTTCTTCCTCACACCTGATGC		ATATACTTTCTGCCCCCCTCCACTA	GGCAATGAGTTTGGCTTGCTGAGAGGTAGTGGAGGGGGGCAGAAAGTATAT
139	398	CTGTGTCACAGGCATTTGAGG	P	CGGTAACGGGGATCTGATG		AAACCCTTCATGXTAAAAATCTAGCCC	CACACAKGAAAAGAGAGCTGAGATTGGGGCTAGATTTTTAGCATGAAGGGT
140	399	TCGGTACACCAGGGGATCT	P	CATTTAAGAACACCTGAGTTATGCTACA		AAAGAAGATXCTATCTGTGAGAAAGCA	AATGACTTAAAAATTTTTTCTTCCTCTGCTTTCTCACAGATAGCATCTTCT
141	400	AGCTTACATTTCTGCATCAGTTCAT		CCTTTTCAGACGGGCACTT	P	TCTTGGATCCATCCTCTGAAAGGTC	TCTTGGATCCATCCTCTGAAAGGTCGTTTCTTCTCCATAACACTCCTTGGG
142	401	ATGAGAACCCTGGAGGTATAGCA	P	CAATTTTGTCTATACATAATCTACCAAGCC		CAAGCXAGTGATTTXCCTGGAATTATC	STAGTAATTGACTCTGAAACCCAAGCGATAATTCCAGGAAAATCACTGGCT
143	402	ATTATAAAGTCAGAGAGGTAGAAGGAGAACA	P	CTTTTGTCTGTGCTGCTCCTAACT		AGTCCACTGTGCTCGGCTGTCTACT	AAATGAGGTGCTTTAGAAGTTACATGAGTAGACAGCCGAGCACAGTGGACT
144	404	CTTGATAGGCGGCTTTTACCTT	P	GACATAAAAATTGGATAGAAAGCATTTG		AAGCATTTGATXTACAAGATTAAACTG	TCTGGTTGCATTGCAAGGTGGCCTCGCAGTTTAATCTTGTAAATCAAATGC
145	405	GTGGATACAGTTCAGATTCCTAACCA	P	TTATCACATGGGGACTACACCC		ACCCCATCACAGTCTCATCTTATTC	TGGGAAAAAGTAAAAGATATGTAATGGAATAAGATGAGACTGTGATGGGGT
146	406	ATAGTGCACAGTCTTTATCCCTTTTTT	P	CTTTGTGGAGGAGGTAACTTCACA		CAAATGGCTTXCTTTGGAGGCTTTATG	ACCCTGTGGACTGGAGCTAGGGGTGGCATAAAGCCTCCAAAGGAAGCCATT
147	408	GAACTGCAAAATCTCTAATATCTTATTTTCTG		GGGGGAAGGGATGCTAATTAA	P	CCTCTGAGAAATGGGGATATGATGC	CCTCTGAGAAATGGGGATATGATGCCTATTAAGCTGAGATAATCAAAAATA

Row#	REF#	1 Upper PCR primer	Modified	2 Lower PCR primer	Modified	3 GBA primer	4 Flanking sequence
			-		-		
148	409	CCRCTGAATTTATATAGTACTTTTTTTTTGG	P	TCCACCCAGTTCGAGCTTC		CGGCCGCTTTGTTTACCAACTGTTA	AAACTTTCCTATTATACATATAATACTAACAGTTGGTAAACAAAGCGGCCG
149	410	GGAGCTTGCAGTGAGCTGA	P	CATGAGGAACTGTTTTCTTTTCTTTTT		TTTTTTGAXACGGXGTCTCCCTCTGTC	ATCGSCCACTGCACTCCAGCCTGGGCGACAGAGGGAGACTCCGTCTCAAAA
150	411	AGAGATTAGTTGCTGGGCTTTG	P	GCTTGCAGACTTGTCCAGC		CCACAAATTCCAAATAACAGAACCA	GTTGCAGGATATATTCCTTTGTTGGGTGGTTCTGTTATTTGGAATTTGTGG
151	412	TGAAGGAAAAAAAAAAAAAAGGC		AAGCATATGGTCTGTCCTGGAG	P	TGACACTCTACCCAACAGCAAAAAA	TGACACTCTACCCAACAGCAAAAAAACCTTTCTTCTCAAGTATACGTGGAA
152	413	TGTGGATGTACCACATTTTATTGATC		GTATATGACTCAAAGAAAGTCAGTTATTCTACG	P	GGGCACCTAGGCTGACTCCXTGTCTTT	GCACCTAGGCTGACTCCATGTCTTTGCTATTGTAATAGTGCTGCGATGAAC
153	415	TTTTGCACATTGAGTGCTTAGG		GATTAGAAACCACCATGTTTACAGGA	P	AAGCCCTXAATCCAGAGAXATGTTTAC	GCCCTAAATCCAGAGATATGTTTACCACTTCCTGGCCCTGCCTTCYTAATA
154	416	ATAGACCTAAAGCCCTAAATCCAGAG	P	GTAAAACATTCCTCCAAGAACAGGT		GGACCTATCCAGAAGGAGATTATTA	TTTACYACTTCCTGGCCCTGCCTTCCTAATAATCTCCTTCTGGATAGGTCC
155	417	AATATTTCCAGGAAGCTGCATTC		CTTATCATATTTTTCTCTTTACCATTCTCTTAC	P	GGTAAGGGGAGCTACTGGTCATACA	GGTAAGGGGAGCTACTGGTCATACAGCAGCATGGAGTGAGTGAAGTGAGAG
156	418	TCCTCCAGGACAACAAGGATT	P	CATATAGGAGTTTATCTAAGGGAAATCACA		TATGCCCTACAACTGCTATAACGCT	GTATTTGCATGCATGCAAAGAGTGGCAGCGTTATAGCAGTTGTAGGGCATA
157	419	ATCATGGCCTGATTGGCA	P	CAGAGCCATCAGTTCTCCG		GGGGAAGCAGAGGGAAGACAGTGGC	GATCTTCCCCCAGGCTCTTGGTGCACGCCACTGTCTTCCCTCTGCTTCCCC
158	420	AAGAGAACAGGCTCCTTTTCAAA		GTATTTTTTGTAGAGTGGAGGTTTTGC	P	AGGTCTGTGATGGGGTAGAAAGCAA	AGGTCTGTGATGGGGTAGAAAGCAAGAGTTCAGCCTGGCCAACATGGCAAA
159	421	GAAGGCTGAATGATATTCCATTGT	P	AGAGAGACTGCGGGACCAT		GTGGTAGTTCTTTCTTTAXTTTTTTGA	TTTATGGAAAACAGTATGGACGTTCCTCAAAAAATTAAAGAAAGAACTACC
160	422	CAGCCCAAAACATTCAAGGA		ATTTCGATGACCACTTACCCTTACA	P	TTCAXATCATTATTATTTTTTTTATAG	CAAATCATTATTATTTTTTTTATAGCTCACAGTGGCTGTCTGTGCTTTTGT
161	423	TGCCCTCTTCCTGTAACACC	P	CTGACTCCTTTTGAGTATCAGGGA		CAGGGAACAAGCCAGRCTCTGTAGA	GTGAGAACTTCTTGTGCATTAACACGTCTACAGAGYCTGGCTTGTTCCCTG
162	424	TGCATATAGCAGATCCTGAGGC	P	AGATGATATTTGGGTGAGGACACA		GGACACAAATCAXAACCAXATTATTCA	GTCTTCTAAATAATACATATTGTCACTGAATAATATGGTTATGATTTGTGT
163	425	GTTATGTCATGTGCTGTAAAGTTAGGTCT		ACTTCAAAAATTCACATAGCACAATTG	P	TTAAAAATXAAAAATTTAGATTAAAAG	AAAAATAAAAAATTTAGATTAAAAGCTAAATTTAAGAAAGTTACTTTTGAA
164	426	TAGTTCAAGACCAGCCTGACG	P	GTTTCAAGCAATTCTCCTGCC		CCCAAATAGCTGGGATTACAGGAAT	ACAAAATTAGCCGGGCGTGGTGGCGCATTCCTGTAATCCCAGCTATTTGGG
165	427	GCAAAGTATCCCAGACATGTAAACA	P	TCCTGCTATTCTTCAGCTAATTTGTT		TGATAATTTAAAACAATAACAAGAG	TTTTCAACAGTACTAAAAGAAAACAGCTCTTGTTATTGTTTTAAATTATCA
166	428	TGTAAATCAATKTATTTTCAGTCCAGG	P	TTTACATTAGTTGCTTTCCTCAGGTG		CTCAGGTGCACACATCATTCTCTCC	CTGCTCAACTACCATTATCCAGCAACGGAGAGAATGATGTGTGCACCTGAG
167	429	TGTTCTAGTTAGAAGAATTTACACTAGGAAAAA		CCTCAGGTGCACACATCATTC	P	AATGGTAAGAATAGTGTAAATCAAT	AATGGTAAGAATAGTGTAAATCAATGTATTTTCAGTCCAGGGAAGGCTGCT
168	430	CTCTGATATTTACACTGACGATTTGCT		TCCTGAGRCCTCCCCAGC	P	ATACAAGXTTAAAAGAGAAATCGTTGA	ACAAGATTAAAAGAGAAATCGTTGAGAATACAATTTCTTTTTTTTTTAATA
169	431	CAAAACACTTCTATACCTAATTCCCTTTT		TKACCTTGATTTATACATGCTACGATC	P	TCTCCATGAAAAGATTXACTGTTAAAC	TCCATGAAAAGATTAACTGTTAAACGCCCTTTCTGCATCTGATGATCGTAG
170	432	GGGGATCTTGGGACGCTG	P	AATTGTTGGCTTGAAAGGTAATTCTAT		ATTCTATTTTAAAYTCTTTGTGAAA	AGCCACTGTTGAAAGCTGTTTGGAAGTTTCACAAAGARTTTAAAATAGAAT
171	433	TATTATTAGGCCATTCTTGCATTGC		CACCATGCAGATGCCGTC	P	AGGAAAAGAGATTTAXTTGGCTCACAG	GAAAAGAGATTTAATTGGCTCACAGGTCTGCAGGCTGTACAGGAAGCATGG
172	434	GGTACCGGGGATCTTGGG	P	TCTTTGTGAAAYTTCCAAACAGCT		GGCTXAACTAATTTACATTCACACCAA	GGAGAAAAGGGAACATTAATACATAGTTGGTGTGAATGTAAATTAGTTCAG
173	435	TGGAGGTTTTGTTCCCAAAC	P	TAAAATGCGCTGGAAGCTCTC		CTCAGCAGTAGAATCAAACAAGTAG	TCTTGGAGGCTCTGAAATTCTTTGTCCTACTTGTTTGATTCTACTGCTGAG
174	436	GAAACTGCCCCCATGAGC		GTGTTCCCACCCAAATCTCA	P	CAATCACYTCCCACCAXGTCCCTCCCT	ATCACYTCCCACCAGGTCCCTCCCTCGGCACATGCGGATTACARTTCGAGC
175	437	GGCTTGCATTCCTAGTAAAATTGA	P	TTAGCTTTCTGAAAACTCATTATGTTGA		ATTATGTTGAATATGGCATTTGGGA	GAGCCTGTATCCCTTACAGTAGAAACTCCCAAATGCCATATTCAACATAAT
176	438	TATATCAGTGGGCTCCTTCCTTG		CTTTATAGCAGTATGAAAATGGAATAATACACT	P	CCTTTAAAACTACTGAAGTCTGAGC	CCTTTAAAACTACTGAAGTCTGAGCCTGACACCAGAGATTCTGATTTGCTT
177	439	CATGTGATAGAGTTATGGCTAGTGAATG	P	TTTTAGAATCTTTTCCATTTATCCAGTG		TATCCAGTGAATGGGGAAAAAGAGA	AAAATCTTTCCACAAAATTCTTTGCACTCTCTTTTTCCCCATTCACTGGATA
178	440	TGATGAAAAAAGGCACATGTCA	P	GCCTCAAGTTTCAGGGCC		TCTTTGCATGGGCTGTGGGAGAGGA	ATATGGCCATTGAATACCTTGCAAAGTCCTCTCCCACAGCCCATGCAAAGA
179	441	GCTAGACATTTTCAATAGGCACCTC	P	TGTAGCCCAAGGTGGTCAGA		AAATATAXATTTTATTTGACATCTCCC	AAAAAAGTTTCCAAAATTTAAAAATGGGGAGATGTCAAATAAAATCTATAT
180	443	CAACCATTTTTCTGATAATTCTGTGA	P	AGGATGTCACCATTTTTGTGGT		TTTTTTGCAATAATCCATTAGAAAG	GTTTTATCTTTTCTTAAAAATGTGTGCTTTCTAATGGATTATTGCAAAAAA
181	444	TRCTCCTTGATCCGTGGAGT	P	TGCACCTAGTTACCCAAGAGCT		AAGATGTWCAAGATCAATGTTTTCA	CAGAATGGATGTTGTATTAGCAGACGTGAAAACATTGATCTTGWACATCTT
182	445	TTTGCTTCCCCTTCTGCC	P	CAATTTACTGTATTAGCCTGTTCTCACA		GAGTGGGCAATTTACAAAGGAAAGA	CTATGGAACTGTGAGTCTATTAAATATCTTTCCTTTGTAAATTGCCCACTC
183	446	AGAAGTCTTTTACATGGAAGAAGAAAAAA	P	CRAAGACTAACAAAGGTGGTCTAAGG		GTCTAAGGGAACAACCGAGTGTACC	CTAAGAAAGGAGAGGTTTCAATAGACGGTACACTCGGTTGTTCCCTTAGAC
184	447	AGGAAAGTCTTTGACTCCATCCTC		AACCCCAGCTATTCTTATTAGCACA	P	CTCATACTCAGACCTAXTTCCTTCTAA	CATACTCAGACCTAATTCCTTCTAACAAAGGTTCTTTGGAAGGTATGTGCT
185	449	CCCACCTCTAGCAATGCAG		CAAATCAAAACCCCAATGAGATAC	P	TTACAATTCAACATGAGATTTGGGC	TTACAATTCAACATGAGATTTGGGCGGGGACAAATACCCAAACTATATGAA
186	450	CTGGGGCCAACTGCATTT		AAGCTGGTGGTAGTAGAAATACATGG	P	CCACCTGGATTCCACAAGACACCCT	CCACCTGGATTCCACAAGACACCCTGGCATCTTTATAATAAAATCCATGTA
187	451	AAACAAGAAGACAAATGGAGGTTG		GTTTCTGTGGAGAGGACCGAC	P	AACCAGTTAGAGTTCCATTTTGTGC	AACCAGTTAGAGTTCCATTTTGTGCCAGGACAGTTCTGCCAAAAAGAACTT
188	452	CAGAATTGCATTGGCTATTTGG		TCCCCATGTTCGTGGATTAG	P	AATXTCTTTTGTATTCGGATAGTGA	AATATCTTTTGTATTCGGATAGTGACTTAATTCTGTAGCTCTCTTTTGGTA
189	453	GTTCAACTACTTCCCACCGG	P	TTTCAGGTTTCAATGTGTACTTTTAACA		TATTTATAGATTAXATGTATTTAATTTATGTAATAAAATACATTTAATCTATAAA	
190	454	TAGAAACTGGAAAAAGAGGGAGC		GATACAGASAAGATTGCAGTGTGG	P	GATGCAGTCAAGGCAAGGAAGAGGG	GATGCAGTCAAGGCAAGGAAGAGGGGGAAATACCCTTCTTCTTGCTTTCCA
191	455	TCATGGCTGGAAATGAAAGTATC	P	CTGGAATGGGAGAATAGTGTGTTT		CAGTCACAAAGCAGAAGACCAACTC	TGAAGTTCCTGAAACATTACTTTACCGAGTTGGTCTTCTGCTTTGTGACTG
192	456	AAACCCCGCCGAAGGTAC		TTATTCATTTTTTTCCCCAGCAC	P	GAGGATCTGCTGCACCAGGCAAATT	GAGGATCTGCTGCACCAGGCAAATTCTGTGCAAAATGCAAATTTCTGTGCT
193	457	AAGTGGGAGGATCACTTGAGC		CTTCTTTGTCTTTTGTGAGACAGTGT	P	GGXTXCAGTGAGCTGTGATAGCACCAC	CTGCAGTGAGCTGTGATAGCACCACAGAACTGCAGCCTGGGTAGCAGAGTG
194	458	ATGGTGAAACCCATCTCTACTAAAAATAC		CTAGGTTCAAGCGATTCTCCTG	P	GGCGTGGTGGTGCACTCCTGTAATC	GGCGTGGTGGTGCACTCCTGTAATCCCAGCTACTCGGGAGGCTGAGGCAGG
195	459	CTGCCTTCCTCTTTGCCTTC		TTATAAAGAACAGAGGTTTAATTGGCTC	P	GTAAGTTTTCTGAGTGCCCCCCTCC	GTAAGTTTTCTGAGTGCCCCCCTCCCACCTTGATCATGTTTCCTATACAGC
196	460	CGTAGAGTGAAAAGGAGTGGGA	P	CTGGCTTGGGACGAAATTTT		TTGAATGAATTTTTTTTAGCATAAA	TGAAAGTATAAAACCCTTAAAAGACCTTTATGCTAAAAAAAATTCATTCAA

Row#	REF#	1 Upper PCR primer	Modified	2 Lower PCR primer	Modified	3 GBA primer	4 Flanking sequence
197	461	AGCTGCCTTCTTGCTGTGTC	P	GAACTGATAGGATTAGTGTCTTTATAAGAAGAGA		AGAGGGCTGGCACTTTCTTTCTGTG	CACAAGGCTTTTCCTGAGTTCCTGCGCACAGAAAGAAAGTGCCAGCCCTCT
198	462	CTGGGGGCTTTGTTTTGTTT	P	AGTGACCATATCACCCATACAATCTATAG		AGTTAATGCAXTTCCCATCAAATTA	TTTTAATTTTGTGRAAATAACGTTGGTAATTTGATGGGAATTGCATTAACT
199	463	AGCTGGTATCCTATGGGCTTTT		CCCAAGACAGCAGCCATG	P	CCAGCAGAACTGAGAAGAGGAAGGT	CCAGCAGAACTGAGAAGAGGAAGGTGGGGGAGCCCAGCTTCTCGGTGACTG
200	464	GTTGAGTTCAATTATTTTTCTTTTCCAC		TGGTAAATCAGAGACTGTAGTTATCCATC	P	AATTGGGTCTAATTTGATAAACTCC	AATTGGGTCTAATTTGATAAACTCCGTTTCCAGCGGTTAAAATATAGATGG
201	465	AGCTTGGGTTCAAGAGGGAG	P	TGGCCTGAAGCCCACGTC		TCGXAATGCGCTTCAGAGGCTTTTCCT	TCCAGCAGGCGTAAGTAGTGGCTGCCAGGAAAAGCCTCTGAAGCGCATTCC
202	466	TCCTGGGTTCAAGTGATCCTC	P	CAACATATGGAGATCCTATCTCTACAAAA		AAAAAAACCCAAAXTTAGCCAGCCA	GCTGGGACTACAGGCTCGAACCACCGTGGCTGGCTAATTTTGGGTTTTTTT
203	468	ATAGAAATGATTAGACATCAGGAAGAATTC	P	AGCTAATTTTACACCTAGATAGCTGGAGA		GAGATGTGGTTAATAAGAAGAAACA	TTTTCCTTCAAATGTTATTCAAAATGTGTTTCTTCTTATTAACCACATCTC
204	469	CACTTTACTTAGTATTTCAAAAACTTCTGCA		GTTTATACTGATGCCATTATATTCCTGATC	P	ATTGXGAAGAATGAATCTCTCACTAGG	TGTGAAGAATGAATCTCTCACTAGGAAGTTGCATTAGAGGATCAGGAATAT
205	470	TTTTTTTGGTCATATAAAGCTAATGGG	P	GTACTTTTAAATGAAAGGCTGTGGACT		TGTGGACTCCCATGAACCTAGAATG	ATTTTTTCAATCTCAGGATCACACAGCATTCTAGGTTCATGGGAGTCCACA
206	471	CAGCCTCCAAAAAGACAAAGTC	P	TCTGTAGCCAGCAAGGACTGTAT		ATTAAGAAAAAAAAAAAAAAGATCAG	AAAATGCTTACCCAAGTCAATGAGCACTGATCTTTTTTTTTTTTTCTTAAT
207	472	AAAAAAATAGCTGGCATCCAA		GCCAACCTCGTCTGAGCTC	P	GCTGACCCAGCCCCCTTTGTCTCCC	GCTGACCCAGCCCCCTTTGTCTCCCGCCTGGGTCCCAGAGGCAGCAGAGCT
208	473	ATTTCTGTCCTATCAGAATGTCCTTTT	P	GATTGTAAAATGCACCAATCAGC		TAAAACGCACCAATCAGCAGAATCC	ATCTTCCCTGTGACTGGCTACTTTTGGGATTCTGCTGATTGGTGCGTTTTA
209	474	TTAGTGGACTGAAGTTATAGGTGCTAAGA		TTCTAAAATGCTTCACATCCCC	P	CATTXACTTTTTCTGTAACTTAGGAGA	TTTACTTTTTCTGTAACTTAGGAGAGTAGGTCACCCATCAGCAAAAGGTAA
210	475	GAAGGCAGAGTAGGTTTTTTTAATTCA		TATGGGCCTGTATTTCTGATATTTCA	P	TAATTATTTTCCTTGGCAGGGATTT	TAATTATTTTCCTTGGCAGGGATTTGAAACATTATTTGGCAACTGAAATAT
211	477	GACAAGTTTTGGCTGTTGATCTTC	P	CCAAATCTTCCAAAGTAGGCAA		CAAAGATACAAATTTTCAGACATTG	AAATCAATCTAAGTCTGGCATTTACGCAATGTCTGAAAATTTGTATCTTTG
212	478	TTAGTTCACAGTACTCGATAACCCTTG	P	GCCCTTCCACTCTACACACAC		CACCGTCGGTAGCTTCCTCATGCCT	GCACTCGGTTGAATACTAATTAATACAGGCATGAGGAAGCTACCGACGGTG
213	479	TCCACAGCAAATAATGCATGAA		GTTTCATAACTGATTTCTTTTTCCAGTG	P	CCTTGAAACTACTGAACTCATTAGT	CCTTGAAACTACTGAACTCATTAGTAGCCGGAGCAATAGACTGAGTGCAAA
214	481	TTTTTTTTTTTAAAGACAAGTCTCGC	P	ATTGCTTGAACCCAGGAGG		GCGGAGGTTGCAGTGAXCTAAGATCAC	TGTCCGCCAGGCTGGAGTGCGGTGGCGTGATCTTAGCTCACTGCAACCTCC
215	482	TTTACAACTCAGAAAGGGAAACAAG		CTATAATGCCCCACCTCTGTTCT	P	TCCCCTCCTCTGGTTTTTTGTTTTTT	TCCCCTCCTCTGGTTTTTTGTTTTTTGGTTTTTTTTTTTTTAACTGAGTCATG
216	483	CTAACCAACAGCCAATAAGAGAAAAT		TGCATAAAGGTGAACTCTTCTTGC	P	AACATTTGGAATTTTCTTACCTTTA	AACATTTGGAATTTTCTTACCTTTACGCAGACTTTTCACTGCTCAGAGCAA
217	484	AAAAATAGCCTTGACTGACAAACTATGTATA	P	CAGGCTCTTGAGACCTCTTTCTC		CTTTCTCXAAGGAACTCTGXTCTGGCT	TGGGATTGGAATGCAGCAAGCCCAGCAGCCAGATCAGAGTTCCTTGGAGAA
218	486	TTATCTTAGGTTTCGGAGAGCCA	P	CATAATGAGTTCTCAATAAATGTCAGGTC		GGCTCCCTCTTCTCTAAAATCCCAA	CAGGCCTTGAAAGCCTTCATCATGGGTTGGGATTTTAGAGAAGAGGGAGCC
219	487	AACCAAGTATGGAAGCCTTCTCC		CACCCTAGAGGTTAACAGGACCC	P	AGATGTXTCAGGGAGCTTGGAGAAAAG	ATGTCTCAGGGAGCTTGGAGAAAAGGTGACAGCCCTGCGGATGAAAGGGTC
220	488	CAACCTCCACTTCCCAGGT		CTACTAAAAATACAGAAATTAGCCAGGC	P	TTCAAGXAATTCTCCTGCCTCAGCCTC	CAAGCAATTCTCCTGCCTCAGCCTCCCAAGTAGCTGGAATTACAGGCCCAT
221	489	GGTTTTCAGAGGCATTCAAGC	P	TGCTTCAACAGACCTCAGTATTTCT		CAAATTAAATTTAATCACAGGTATT	GTCTTTTGTTTTCTGACCAATCTAAAAATACCTGTGATTAAATTTAATTTG
222	490	ACAGCCTCCAGGAGACAGAC		CTTAATCACAGCCCTTTGGTATGT	P	CATTCTTTGGTAAGTCCXAGTGTGTCT	TTCTTTGGTAAGTCCTAGTGTGTCTAATGAGGTGTCACAGGCCTTGAAGAC
223	491	TTATATCTAGTATGGTAATTTTTGCAGGGT		CTAATCTTTACTGTCAGTCTTAGGAAGGTAATTA	P	TCCAGGAAGCAAGCCACTTTAGCTA	TCCAGGAAGCAAGCCACTTTAGCTAGAACCCCTGCGGGTTGTCACACAAAG
224	492	CACTTTTATCTTCACAGCGCACT	P	AGTGTCATTTCATTTCCTTGTGTATG		TTCXAGGGTTTCTGGGATTCTTTTGGA	CCAGGGTTTCTGGGATTCTTTTGGAGAAACTAAAAATACACTAATTTTATA
225	493	AAAATGATCAAGCCTTTCTTTCATG	P	GTTATACTACTACTTTTAGACCAAAGATCCAGC		GACCACCAACTCAAAAAACACAAAT	ATTAAACAATGTCTGCTTTGTAAGAGATTTGTGTTTTTTGAGTTGGTGGTC
226	494	ATAAGATGAAGTGCAGATGCAATG	P	CTTTCAATTTTTCTCTTCTCTCTTGCTA		TTTGTAAAACCACTGTTGCCATAGT	AGACCAAGTGGTTGTGGCACTTAGTCACTATGGCAACAGTGGTTTTACAAA
227	495	CATGGTATCAACCTCTATGTGCAT	P	CAAGTGCTGTAAAGGAAAAGCAG		GGGAGGGGAAATAGCAAGTGTTATA	GGGCAGCAAGCTCATTGATTGCTTGGTATAACACTTGCTATTTCCCCTCCC
228	497	TTGCAGTGAGCCGAGATG	P	CATCATACCTGGTTGGGAGATG		ATGGGGAAXCAGATGCAAAATGATGAA	AAAAAAAAAAGAACTATTTCTCCTCATTCATCATTTTGCATCTGATTCCCC
229	498	GACAACAATTTGCCATGCATT	P	GGCATTGGCTTAATGACCATT		AGTGAAAAATATGAGAGGCAAAAAG	TTACATGCATTACAAAAATAGCAATGCTTTTTGCCTCTCATATTTTTCACT
230	500	TATGTACCTAAGTTAAAACTGAAGGGTCC	P	CATCATGCTCTGGGGTCACTA		TACAGGACTACCAAXTTCACATCTG	CTGTTTACAAATGACACATTTCCATGCAGATGTGAATTTGGTAGTCCTGTA
231	501	TTTAAGTTCTGGGATACATGTGCTG		AAACCTAGATGATGGGTTGATGG	P	TGCAGGTTTGTTACATAGGTATACA	TGCAGGTTTGTTACATAGGTATACACGTGCCATGGTGGTTTGCTGCACCCA
232	502	CCTAAATACCATTTGAATTGATAAAGATGTA		AGTACTAGTGAGTATTTGATTACTAGGTTACACTA	P	CTCAACTCAACTCTGCTTATATGTA	CTCAACTCAACTCTGCTTATATGTAATAGATCCATATCCCTTATGTAGTGT
233	503	TAAGATGCAGGTGAAGTGGCTTA	P	AGTTCAGTTCTACTAAAAATCTGGGCA		GGCAGGCAGTCTGAGACAAACTCCC	AGGAAGTAGTTCAATTTGTATTTGTGGGGAGTTTGTCTCAGACTGCCTGCC
234	504	TGAAGGCAGTTTAGTCACCAAATTA	P	GGGGAGTAGAAATTGAGAATAGGG		AGGGGATXGCTAATTTTCTXCAATTCG	ACTTGGTTTCAGAGCTCTTGAGTTTCCGAATTGCAGAAAATTAGCAATCCC
235	505	GCAACTTAATCTCCATTGCAGG		TCTAGATATTTATGCCAATCCCATCA	P	TTTTATAGCATAGTAXTTTGGAACATT	TTATAGCATAGTAATTTGGAACATTGTGTGGCATTTTTATAACAAAAAAAC
236	506	TGTAGGGAAGTATGTTATGCAGAGC	P	AGTCTCTTGTGACAAAAATGTACCAG		GACCCAGAAACTGATATXAATGCTTCA	CCCAGAAACTGATATGAATGCTTCAAATAAATTCTGCAGAAGCAAAGCTGG
237	507	TAAGATGTCTCTTAATCCAGTTTTCCC	P	AGGACAGAGGGAAGTTGGGA		GAGGAGGGTCCAGGAAAGAAGGGAA	GTAATCTCTACCAGATAATCCAGCCGTTCCCTTCTTTCCTGGACCCTCCTC
238	508	GGCCTTTCCCACACCAGC		CTTCCGAACTTCCCTCTGTCA	P	GAAGGGTAGCCAGGCAGTAGAATTT	GAAGGGTAGCCAGGCAGTAGAATTTCATTCAACCCTAGGGTTCCCACCTGA
239	509	GTCAGGCCCCCAGATGAG		CTGGTCCAGGTAATAACCCAAAC	P	GGCTGCGGCATCGATTCTGACCACA	GGCTGCGGCATCGATTCTGACCACACATTCTGGAAAATTATCATCCTACA
240	510	CCAGCAGCTCAAAAACACTTG	P	ACCCCTTTTTCTTAGGCATGTTT		TGAAAATAAAATAATAAGAAATATA	AACATAAATAATAATGTACTTAATAGTATATTTCTTATTATTTTATTTTCA
241	511	CCACTGACGTTATTCAAATGTACAC		TCTTTCATAACAAAAGAAGAACAGC	P	ACAGATGTGAAAAATAGCATAAGCA	ACAGATGTGAAAAATAGCATAAGCAAACACAACCTTAACAAGGCTGTTCTT
242	512	TGCCTCATTATTATGGGGGAA		CATGTCTGGACAAACCCTCCT	P	AGGGCACTTGTGTGGTGGAATAGGC	AGGGCACTTGTGTGGTGGAATAGGCGGGATGGGGGTGGTGCATTTTATCCA
243	513	ACATCAAATTGTACTGCAATAATATGTACAA	P	TGCATGTTAGAATTTTCTGGGC		GXACTGTTGAAAACTCCCCXTGCCCCA	TCCACAGAAGTTTTCATTTAATTGTCTGGGGCATGGGGAGTTTTCAACAGT
244	515	TTTCATTCTCAGTAGAGCTTCAAGG	P	TAATGACCACTGGCGCTG		CCTGCTGCTCTCTGAACTCCTCTCT	TTCCCAGAGAAGGGGCACAGTTCCACAGAGAGGAGTTCAGAGAGCAGCAGG
245	516	TTTATAGGGTTTGGTTTTATTGGGA	P	GAAGCTGCTGACTGCCTGA		TGATCTCTGTGAAACTTAGGTGTAA	TTTGAGCTGTATAAAACTGTAAACACTTACACCTAAGTTTCACAGAGATCA

Row#	REF#	1 Upper PCR primer	Modified	2 Lower PCR primer	Modified	3 GBA primer	4 Flanking sequence
			-		-		
246	517	TACACAGACGCTCTTAAGTATCTGACA		AAAGATGTCAAGGCTTCAGAAGG	P	GTAGTGACCAGCACTCAAAGATAGC	GTAGTGACCAGCACTCAAAGATAGCGCATATGAGCGGCTCAGTCAATCACT
247	518	AAGCAGCGACCCGACCCG		GAATGTGTCACCTGCCATGAC	P	TGGGGTCCCTGGGGCAAGCGAATGG	TGGGGTCCCTGGGGCAAGCGAATGGCCCTTTGCCTGGAGAACCTGGGCCAG
248	519	GCTAATGCAGTGAGTTTAAGTGTTTAATT	P	CACCAGCAGTTACTAATTTTTTCTAAATTAA		AACACTTAAACTCACCGCATTAGCA	ATTAGTAACTGCTGGTTGCCTCATAGTGCTAATGCGGTGAGTTTAAGTGTT
249	520	AGAATGGTGTGAACCCGG	P	CCAGAAAGAACTATTTCAGGCTTAGTT		TTAGTTTTTTCTTTTTCTTTTTTTT	CAACAGAGTGAGACTCCGTTTCAAAAAAAAAAAAGAAAAAGAAAAAACTAA
250	523	TTCAGGCTGCACCCCTTC		CTGTGGACTCCCTGACTTCC	P	ACGAACTCGGATGCACCTCTGTGAG	ACGAACTCGGATGCACCTCTGTGAGAGGACTGCTCAGTTCACCGGGGTGGG
251	527	TTAAGCAGCTTGCCCAAGG		CATGGCGTCGTAGTTGCAG	P	CTAGTAAGCAAGGAACTGAAAATGA	CTAGTAAGCAAGGAACTGAAAATGACGCTGGCCTGTCTAACGTGACAGTTC
252	528	ATCAGGAGCACTTGAGCCC		GACAAGGCGAGACTCTTGTCTC	P	ACCACATCCTAACATCGTAACAAAA	ACCACATCCTAACATCGTAACAAAAGGAGACCCCCATCTCTACAAAACAAA
253	529	CTCCACATTACCAAGAGGATAGGTC		GTAAAATGCTCAGCTCAGATGGA	P	AAAGCACCAATAACAACAGTAGCAG	AAAGCACCAATAACAACAGTAGCAGCTCATATTCACTAACTGCTCAACATG
254	530	AACATTCTGACTGGCGCTGT	P	CTCATACATCTGTCAGTAATAAAGCCAA		GATAAGTAACTGAGACTGAAACGCC	CTGTGGTCAGGGAAATGGAATACAGCGGCGTTTCAGTCTCAGTTACTTATC
255	531	TGCTGGGATTACAGGCATG	P	AACCTTTGGCTAAAAGGGTCTG		CTGATTACCCAAAGAGATTAGAAAC	GCCACCATGCCCAGCCGCCAAGAGGAGTTTCTAATCTCTTTGGGTAATCAG
256	533	TGCTCACCATTTTTAAACATTTATTTG		GAGGCAGGAGAATCGCTTG	P	TTCTTTTTGAGGTAGAGTCTTGCTC	TTCTTTTTGAGGTAGAGTCTTGCTCCGTCGCCCAGGCTGAAGTGTAGTGGC
257	534	TAGCTGGGATTACAGGCGC		GATCACTTGAGGCCAGGAATT	P	AATTTTTGTATTTTTAGTAGAGACG	AATTTTTGTATTTTTAGTAGAGACGGGGTTTGTGCCATGTTGGCCAGACTGG
258	535	TGAAAACCAAAGCATTGATAGGG		GCCAAAAAGGCAACAGGG	P	TGCATTGAGTTGTTGGCAGAATTTC	TGCATTGAGTTGTTGGCAGAATTTCGTTCCATGGTGCTGTAGGATTGAGGT
259	539	AGTTTTCCTTTTCTTTTTCCCATG	P	GTAGTAAATGGCATAGAAGACAGGGA		GACAGGGAATAAACAAATAATCTGA	ATCAATGGTGTGAGCAAGGCCACTCCTCAGATTATTTGTTTATTCCCTGTC
260	543	CACACACACACCCATACATAAAAAA	P	ACGTTTAGATATTTTTCTTTATTGAAGGATG		TTCTTTTTATGGCTTGTTTTATATC	TAAACATTATAGAAAAAACATTGCAAGATATAAAACAAGCCATAAAAAGAA
261	544	CTGATCTGATTTCACAGTAAGCTNTTTAC		TCCCAAAGTGCTGGGATTAC	P	TTGGAATACTTTTAGATATACAGAA	TTGGAATACTTTTAGATATACAGAAGAATTATAAAGATAGTATAGGCCAGG
262	545	GTTTAGCCAAAGATTTGAAGCCA	P	CACTCAGATTGTAAAATTTGTAATGCA		TAGAAAATCCTGCTTAGTTTAGGCA	CAATCCTCTAACGAGTACTGTAGTGATGCCTAAACTAAGCAGGATTTTCTA
263	546	GTACATAAACAGTCCTGCCTGCA	P	AGTATGTTCACTTGATTTACACTCAAGTATTTAG		ACTCAAGTATTTAGACCTTTTGTAC	TTGGACCCCAGAATAAGAATATTCACGTACAAAAGGTCTAAATACTTGAGT
264	547	CCTTAAAAGTTTTCTTGTTCACGTAATTAT		CTTCATTTAAAAAAAAAAGTAGAGGACTG	P	ATTAGTTTGTTAATCGGTGTTTTGG	ATTAGTTTGTTAATCGGTGTTTTGGCTGGACCATATGGCCTTTTTTTCTAA
265	548	GGAGAATAGGCTCTCATATGTTAGGTAAG	P	ATGGCTTGCTTCTTCATTTGATT		TGATTCCTTTCTCTGCTCCATGTCA	AATCAGGAAAGATTTCTTTAATAAACTGACATGGAGCAGAGAAAGGAATCA
266	549	AAGGACCGGACATTTTCACTTC		ATATACATCCAGATGGCCTGAAGTAA	P	GTGGAATGTCATCAGTXAAGGCAGGAA	GGAATGTCATCAGTTAAGGCAGGAAAAGGCCATTTAAATTTCACTTCTTTT
267	550	CATGGTTTTTTTAAATGGACTATCCA		AGAGACCACAAGAATAACTCTTYGAATATAA	P	TTATCTTTATTATTCATTCXTGTTTAT	ATCTTTATTATTCATTCATGTTTATGTATTATTTAATATTAATATTATTAT
268	551	TAGCTTTCAAAAATCTACCCCCC	P	CAAAAGTGGAAAAAACAGATTGACC		ACCCCAAATGCTATGCTTTTCTTCA	CCCCTCGTCTGGGACATATGATATAGTGAAGAAAAGCATAGCATTTGGGGT
269	553	AAGGAATGTATCCCTCACTCCAC	P	AGGCATTGCTTAGTTACTGGTTGT		TGTCTCCGCATATTCAGAAAAYAAT	CATGGAAATAAAACCAATCTCAGATAATTRTTTTCTGAATATGCGGAGACA
270	554	GCCAAATCTGTATTCCCAAGTATTT	P	AGAGAGAGAGAGAGAGACTGGTAATAAATAATG		ACTGGTAATAAATAATGGXTTAGCAGG	AAATGTTCCTTTCTGTTAACTGCAGGCCTGCTAAGCCATTATTTATTACCA
271	555	TTTTAAACATCTGCACGTTTCTGA	P	CATTTTGTAACTCCCACATCTGG		TGTTGCCTGCCTCTTTTGCTTCTAC	CCAAAAATGTATTTAAATCTCAACTCGTAGAAGCAAAAGAGGCAGGCAACA
272	556	AAGGAGTCCAAAAACCTTTGACC		GATCTTGCAGCCTTTTTGCA	P	ACTGAXAGTTGTAAGAACTGACCTTTG	TGAAAGTTGTAAGAACTGACCTTTGGCCTAGGATTATGACTCTCATGTAAG
273	557	AATAGCTGACTTCTCTTCCATTTCTG	P	AATGGTACAGCACTTTAGTCATACCAA		CATACCAACCCTCCAGAAAACAAAA	TGGTATTTTTTTCCAGATTTTATAAGTTTTGTTTTCTGGAGGGTTGGTATG
274	558	TTAGGGACTTAGCTGTCTCTCCCT	P	GATGTTCATAGACATGCAGACAGATT		TGATGGCAXTGATATTCAGACACATTA	TCRGATTTTTCCAGCAGATATATCTGTAATGTGTCTGAATATCATTGCCAT
275	559	AATCTCTCAATCTCTCAGCCTTTCT	P	CTAACACCGTGTGTGTGTGTGTGTG		GTGTGTGTGTGTGTGTGTGTGTGTG	CTCTCTCTCTCTCTCTCTCTCWCACACACACACACACACACACACAC
276	560	CTCCTTGTACTTCGAGACCTCAGA	P	TCAGATAAGTAGTACACAAACAATTAAAATAAGG		ATTAAAATAAGGAATXCAATAAAGTAA	TGGAGGTCTTTTGTGATCACCCAGTCTTACTTTATTGCATTCCTTATTTTA
277	561	GGAGAATCTCTCCCTTCAGGAA		GACCATAATGAATTAATCAAAATGGAGA	P	TCTCTTTTTAXAGGCTTTTACCTGATT	TCTTTTTAAAGGCTTTTACCTGATTAAGTCAGGCCTTCCTAAGATGATCTC
278	562	CAGCCTGTGTTCCCTGTCC	P	TGACCTTGTCATTTCTTCCATTCT		ACCTAGTTTTTTTTTTTGTTTTTTT	TAAAAAAAAACAAAAAAAAAAMCCCAAAAAAAACAAAAAAAAAAACTAGGT
279	563	GAATTCTTAATTTACTTTGGCTATCACC		TCCAAGAGTCCAGAAGGGG	P	ATTTTGTCATGTTXAAGATCCTCTA	ATTTTGTCATGTTTAAGATCCTCTAGTCCTGGATGTGTCTTATACCTCAGG
280	565	GTCATCCCAAGAAGAGATAAGGG	P	TTTATGTAGGGGTTATTTAGGATTTCATAA		TTTCATAAACAGATGTAAAXGATTCTT	GAATCAGAGAAGAGGAGCCTTCAGACAAGAATCTTTTACATCTGTTTATGA
281	566	TTACTCTGTTGTCTTCTCATTGTTCAAT	P	CAGGAGCTGCCATTTCAGAC		CAATAACCACGTCTTCAACTTTTCT	GCACTGTGCTAAGTACTGCGAGAAACAGAAAAGTTGAAGACGTGGTTATTG
282	567	AAGTTTACTATGTGAACTTGGGAAAATC	P	TCTGTGCTAAGCACTGGGCT		CAAGAGTTTTTTTTATTGTTTCCAC	CATATCTTTTCTCTTGTATATTTCACGTGGAAACAATAAAAAAAACTCTTG
283	568	GGGGTCTTATTCTTAGCAGAGCA		TGTTGTTTTTGTTAAGAATCTATCATCC	P	GGAAACATAGTAGGCACCCAAGTTA	GGAAACATAGTAGGCACCCAAGTTAGGATTTGATGATGCAGAATGGGATGA
284	569	TTTCCCAGGATGGAATTTTGT		GACAACAGAAAGAGATGTGGCC	P	CTCCAGCCAGTTGTATAGAGAACAC	CTCCAGCCAGTTGTATAGAGAACACGTCAGACAAAACCTTTTCAGATGGAC
285	570	GGACTTGCATAGCAAAAATCAAC		TGTCAGTTTTAGTCACTGATAATAACCCT	P	ATGACTAGGAXAACATTTTGTAATT	ATGACTAGGAAAACATTTTGTAATTCACTTGTGAATAAAGACTAATTTATA
286	571	AATTCCCCTCTCTAAGCCATAGTT		GAATGAACCAGACTTTAGTGTTCAGAC	P	CTAAATGTGTGAGAAAAACAAGCAG	CTAAATGTGTGAGAAAAACAAGCAGCCCACACATAGTTCAGGGCCTGGTCT
287	572	GTTTGCTCTGGATCTTCTTTGG	P	TGAAGAAGTCTCCAAATTGTGAAATATAT		ATATATTCCTTTGTGCCCAGTCTAA	GGTTTTCTACTAAATATTTTAAGTGATTAGACTGGGCACAAAGGAATATAT
288	573	TAATATTGATCTCTGGATTATTGACAGG	P	TGCAATGAAGATTTACTAGATGAAATGA		GAAATGAGAGGGTGGGGCTAGAAAA	TTAAGTGAGATAACTTGCGTGGTCCGTTTTCTAGCCCCACCCTCTCATTTC
289	574	CACTTTAGAGATAAGGAATTTTACTATACGTTAGA		TTCTAAAGAACATTGGGTACTAGATTCCT	P	GAAACCXTAATTATCTATACTAAGAAG	AACCTTAATTATCTATACTAAGAAGACCTGATGAAATTATATGTTAAAGCA
290	575	TTATTTTGTATAAGCTATAAAGCACCTAACTATCA		TGATCTGCCCACCTCGGC	P	TACXTGTTGGXCGGGCATGGTGGCTCA	CATGTTGGCCGGGCATGGTGGCTCACGCCTGTAATCCCAGCACTTTGGGAG
291	576	CAGCACCATGCTTCCTGTAC		ATAAAGAAATGCCTGAGACTGGG	P	CAGCCTGTAAAAXTGTGAGCCAATTAA	GCCTGTAAAATTGTGAGCCAATTAAGCCTCTTTTCTTTATAAATTACCCAG
292	577	TCAGCCTCTCTACTCTAGCCATACTC	P	CAAGAGTTATTCGTTGGTTTGTTTTC		AGTCATAATAXAGTCCATXAACCTTTG	TCATAATAAAGTCCATTAACCTTTGCGTCCAGCTCTGCATGCCCAGTAGAG
293	579	TGCTCGGCTGTGACCTCT	P	CAGTTAGGACTCCATAGCAGGC		GGCCTGCAGTGGCCCTGXTGATAACCT	CAAGCATTCTTCCATGCTCCTCCCCGAGGTTATCACCAGGGCCACTGCAGG
294	580	TTAAATGGCTTCCCCAATGAC		GAAGAGTTCTACTACAATCGTATTGCTGT	P	CCAAATCAATAACAGTGCCCCCAGT	CCAAATCAATAACAGTGCCCCCAGTGAAACACAGCACCTTTGTTACTTAAA

Row#	REF#	1 Upper PCR primer	Modified	2 Lower PCR primer	Modified	3 GBA primer	4 Flanking sequence
295	581	GCATTGCAGAAACAAAGTTCAGT	P	TTAGGCCATTGCTYTTTTGATG		TTGATGTTXCAGAAACAGTGGATTCAG	CTTTTAAATCCTACTGGGCAACCAGACTGAATCCACTGTTTCTGGAACATC
296	582	CATGCGAGTGGGACCATG	P	CTCTTCCTCCTCCTGGTGTCTT		ACTCCCCACTTCACACTCCCATCTA	GACTGGAAGTGGGCCATCCAGACTAATAGATGGGAGTGTGAAGTGGGGAGT
297	583	TGTACAGCAGTGCCAGAGAAAA	P	CACATCAACCTGTATGATCTGCC		TTGAGATAATCCTCCAAAACTACTT	TGTGTCTCAAAAACCTTCAATTAAAAAAGTAGTTTTGGAGGATTATCTCAA
298	584	CGCTACTTATTTATTTCTATCCCAAGC	P	CGCCCAGCAGCAGCTTCC		TTTGCCCCTCCCAACTTCCASCCTG	CAGCAGCCGCGATCTGCGACTGCGCGCAGGSTGGAAGTTGGGAGGGGCAAA
299	585	CGAGAGAGTATATCAAGAAGGCAAAG		TATGCTCAGAGTTTTGTGAGTCAATT	P	ATATTTACCCTGCAATGGAAAATTT	ATATTTACCCTGCAATGGAAAATTTCGTCAATTAGGCAAATTGAATTGACT
300	586	ATCACGAGGTCAGGAGTTTGAG	P	GATTACAGGCAMCTGCCACC		GGCXAACTTTTGTATTTTTAGTAGAGA	AGCCTGGCCAAGATGGTGAAACCCCGTCTCTACTAAAAATACAAAAGTTAG
301	587	AGATGGTGAAACCCCRTCTCT	P	GATTCTCCTGCCTCAGCTTCC		TCCTRAGTAGCTGGGATTACAGGCA	AAAAGTTAGCCGGGCGTGGTGGCAGGTGCCTGTAATCCCAGCTACTYAGGA
302	589	TCACATCGGAGACAGACCTATAATC	P	CAATGTAATTCACTGAAAGYATTCCTAG		CAGAGCTTGGACTAAXGACTTGCCCTA	CAGGCTCCCATATGTGAATACCTAACTAGGGCAAGTCCTTAGTCCAAGCTC
303	590	TGCTGTCGTGGTCTTCCTC		CATTTCTTACCAATTTCCCCAAT	P	ATAGGATTACTCACTCATTCACGCA	ATAGGATTACTCACTCATTCACGCACTCATTCATTGGCCAGATCTGTAGTT
304	591	CAACACCTTTATCCTTTTCTTCGAT	P	TCAATTCATGCCAAAAATATCATG		TCATGTAAGATGAAAGTGAGGTATA	AAGGTCCTGGGGATACCTTAACCTCGTATACCTCACTTTCATCTTACATGA
305	592	TCACTGCAACCTCTGCCTC		CAAAAACTAGCCASGTGTGGTG	P	CAATTCTCTTGCCTCAGTCTCCCAA	CAATTCTCTTGCCTCAGTCTCCCAAGTAGCTGGGATCACAGGCACCCGTCA
306	593	GGGTTCAAGCAATTCTCTTGC		CATGGCAAAACCCCGTCT	P	GGATCACAGGCACCCGTCACCACAC	GGATCACAGGCACCCGTCACCACACGTGGCTAGTTTTTGGATTTTTAGTAG
307	594	CGATCCTTTACCACATCCTTCTT	P	TGTGAGATGATGGCTATGTTCATT		TTGTTCCACTGTAGXAATCATTTTACC	AACATGATGTTTTAAGACACATATACGGTAAAATGATTACTACAGTGGAAC
308	595	CTTGGAAAGCAGGTATATGGAAGG	P	TCTGTGTGTGTGTGCCTGTGT		TCATTTCACTAATGTTGGCTCCTCT	GTTATCTCAACTTCACATTAAACATAAGAGGAGCCAACATTAGTGAAATGA
309	596	TAGATACTAATAACTTCTATTCTCTGATGCATTG		GATTGAGGCTACAGTGAGCTGTG	P	TAGTAGGGCAGACATXAAGCATTTCAT	GTAGGGCAGACATTAAGCATTTCATGTGCATTTTTTTTTTCTTTTTGAGAC
310	598	TTCCCAAACTACTTACCGGAGC	P	CTTGGCCTCCCAAAGTGTT		GATTTTTTAATGTCTTAGATGGAGC	ACAATAGGAAGAACCAGGGATTGCACGCTCCATCTAAGACATTAAAAAATC
311	599	GCCCCTGTAGTCCCAGCTA		TTATTTTTTTATTGAGACAGAGTCGCT	P	TTGGGAGGCTGAGGCAGGAGAATGGG	TTGGGAGGCTGAGGCAGGAGAATGGGTGAACCCCGGAGGGCGGAGCTTGCA
312	600	CATGCATAACTCTGACAGGAAGA	P	GGGACACCCAAAAGCTGAA		AAGCACAGAGGGGTTGGCGAGGAGT	GCCCCTGGGGAGGGAGAGGTCCAGGAACTCCTCGCCAACCCCTCTGTGCTT
313	601	GTGTTTAATACCGTTTCTTCATCTATAACATAA		TGCCACAGAGAGACTTCTTTTTTT	P	TAATGATATAGGAAGCCACTCAAAT	TAATGATATAGGAAGCCACTCAAATGAGGCAGACATGTTGCGTTGCGCTTA
314	602	TAATGGGTGTCTCCTTATGATATCCA	P	CTTTTTATACTCCACTCTGCAAGCG		TATGCAGAGTTCTGGAAGAATTCCC	TTTGATGGCCTTGCTAGCTCAGTGAGGGGAATTCTTCCAGAACTCTGCATA
315	603	TCGGCCTTCCAGAGTGCT	P	GAAATTTTATCATGAGCCAGATGC		TCATCATTGAAATTAGAXCTTCTGGCT	GATTACAGGCGTGAGCCACCGCGCCAAGCCAGAAGCTCTAATTTCAATGAT
316	604	CTTGCAGTTTCTTCCTTTGTTCTACT		GAACACAATGATGCCAAAAACC	P	GTTGTCAAGTTTAATCCTTCCTCCT	GTTGTCAAGTTTAATCCTTCCTCCTGCAAACTCCCTGAGGCAGACTCTTTT
317	605	ATTACAGGCGTGAGCCACC	P	GTGTTTCTCCAGGACCGAATC		CATGAGCCAGATGCTGAGGAAGAGA	AATTTCAATGATGATTGTGCTTTTTATCTCTTCCTCAGCATCTGGCTCATG
318	606	TAGTGTGGATTCTCAAGTTTTCTCCT		CTTGTTAGCTGCCTTCCTTTACC	P	ACTTCCATCATACAGTCTTCAGCAA	ACTTCCATCATACAGTCTTCAGCAACCTTGAAAGATTGGACAAGCTTCAGC
319	607	AAGTAATCCTCCTGCCTGAGACTC	P	ATTTCTTGAGCCCAGGAGATTAAG		ACGAGACCCCATCTCTACAAAAAAA	CTACCACACCCAGCTATTTAAAAAAATTTTTTTGTAGAGATGGGGTCTCGT
320	608	GCAGCATTTTTCATAAGAGCTAAACA	P	TAGCATAATGTTTTAGCACACATTGG		CACATTGGTAGTTTATTTCTTCTTA	ACATGGAATAGAATATCACTTAACTGTAAGAAGAAATAAACTACCAATGTG
321	609	CGTGTACCGAGAGCTGTTTT	P	CAGTCCTCTTGGTCTGGAGAGG		GAGAGGATGGGXCTGGXCTGGTGCCAC	TCCTAGATCCCTCAGCACCTCTGTGGGTGGCACCAGCCCAGCCCCATCCTC
322	610	CAGGAAGGTGGGGAAAAGTG		CAGACAGGAAGCAGGGGC	P	CGACTGGGCATTGGCAAGTGAAGGG	CGACTGGGCATTGGCAAGTGAAGGGCCCTGGAGGCGGGGAGGGGGCATCTC
323	611	TTTTTTTATATTTGGAGTACTGCTCAACA	P	ACATGGCTCAAGATTCTATCATACAAC		TATCATACAACATCTXCTCGCATTCAA	ACTGACCTTGGCGTGACTTTGGCCAGTTGAATGCGAGCAGATGTTGTATGA
324	614	AAATGTGTATCAAACCACAATCCTCT	P	GTTTCTGGCAGAATGTTCCAAA		ATAGGAACTAGCAGCCAAAGGACAA	CACTCCTGACTCGGTCATTTCTGACGTTGTCCTTTGGCTGCTAGTTCCTAT
325	615	TAGGGAACCACTTACTACTCATAGAATCAT	P	GTTTCTATCTTCATTTGTTTCTATACCCTTT		CAATATGTAAGATGGAXAAGATTCTAT	AAGAATTTGCCTGGAAGCAATCTCAGATAGAATCTTCTCCATCTTACATAT
326	616	TTTTTTTTTTGTTTGGAGATGGAGT	P	GGAGAACTGCTTGAACCCAGA		CCAGAAGXCAGAGGTTXCAGTGAGCCA	CAGGCTGGAGTGCAGTAGTGCAATCCTGGCTCACTGCAACCTCTGCCTTCT
327	617	TTGCACATTTTTCCCAATGAA	P	ACTTGAGAGCAGCGTGATTCC		TGAAGAAGGCATCTCTGGATAATGA	TCATCAGGACGCTATTTCTTATGCTATCATTATCCAGAGATGCCTTCTTCA
328	618	GAAGTCAGGGTGAGGGGACA		CGCCATTGCACTCCACCC	P	CATTTTTTTTTTTTTTTTTTTTTTT	CATTTTTTTTTTTTTTTTTTTTTTTGTGAGATGGAGTTTCACTTTTGTTGC
329	619	TTGCTTTATCATCCCTCATCA	P	GTTTTAGAACAGGGCTAAAATGGTC		GAGAGAXGGTGACAXGGAGCCCAGGGA	ACCCTTTGTCATAGCTGCCCCCTTCGTCCCTGGGCTCCCTGTCACCCTCTC
330	620	ACTAAAAATACAAACTTGAAAACATCATGG	P	CAAAGTCCTGGGATTACAGGC		GGCTGGCTCAATTCTTTTGGCACAA	GAAGAAGCCTCTGGGATCAAAAATAGTTGTGCCAAAAGAATTGAGCCAGCC
331	621	TATAATGGAGCAAGTCTTACTTTGTGAG		GAAACACTGGTCCCATTGGAT	P	TATTCAAAAGCTAAATGTGGGTCCT	TATTCAAAAGCTAAATGTGGGTCCTGTGAAATGCTTTCCCATTCAAAAGCT
332	622	CTGTTAGGAAAAAGTTCACTCCTCTCT	P	ACCTTAATTCTCTCCTTAAAGGCCC		GGCCCTATCTCCAAATGTAGTCACA	TTATATGTTGAAAGTCTAGCTTCCAGTGTGACTACATTTGGAGATAGGGCC
333	623	TTTCCTTTCATTTCTTTTCTTTGAGAT	P	GAACTTGTAAGGTGCAGGTTGC		TTGCXGTCAGCTGAGAATGAGCCACTG	CGTCTCAGTCTTCCTAAGCTGGAGCGCAGTGGCTCATTCTCAGCTGACTGC
334	624	TGCAGAGCCCATCTCCCC		GGCCTCCCAGAGCCTCAC	P	CTTXCCTGCAGCAGXCTGGTAGGGCAC	TCCCTGCAGCAGCCTGGTAGGGCACAGGCATTGCCACTCTCTAAGAGGACA
335	625	TAAAAAAGATGCTTCACATACACCCT		GATTTTCTCCCCTACAGGACACC	P	CAAGTGCAGGCAXACAGTGTGACAACC	AGTGCAGGCACACAGTGTGACAACCGAAAATGTCTCTGACATTGTTAGGTG
336	626	ACATAGTAAATGCTCAGTAAATGTAGGCA	P	CTCTTAATAGCAAAAATAAAATATGAGCTATAGG		GACCAATAAGGCAAGAGXCCAGACATA	TTAAGAGGCAGACGGAGGGCCTGCAGTATGTCTGGCCTCTTGCCTTATTGG
337	627	AGATCTCAGGAGGAGGGCTG	P	GTACCTTTCAAATGCTGGCC		GGXCCAGAAAGGTGAGGCAAGGAGGGG	GGGATTCACAGAGATGGAGGCCAGGGCCCCTCCTTGCCTCACCTTTCTGGG
338	628	AAGAGAAATAACTAGTCTTCCTGTCTCAGG		GAACGAGAGATAGAAAAACTGAATAGTAGTTG	P	TGGGAAAAATATCACATATAAGTGG	TGGGAAAAATATCACATATAAGTGGATACATGCAGCTCAATCCCACGTTGT
339	629	ACCAACTAGTGCCAAGCGC		GAATTCTGGAGACACGCTGC	P	ACAGCTATGACXCTGCCTTCTGAGAGG	AGCTATGACTCTGCCTTCTGAGAGGCTTTCTGGAAAGAATGAGTTCTCTGG
340	630	TTGGGTATTTGTTTATAGCAACACAA	P	GAGGTTCCCCAGCCTTGT		TCCTCCACTCCTCCTTCTTTCCCCC	ACTAACATGGGGGTGAGGTTGGAGCGGGGGAAAGAAGGAGGAGTGGAGGA
341	631	CAAGCACCTGTCCACGGT		CTTATACTTTCCTTTCTACTGCGGG	P	CTGXCCAGAGCACAXAACGGGGTTCCA	GCCCAGAGCACAGAACGGGGTTCCAGAGTGCACTCACCTCCCCTCTGAACT
342	632	TCTAGCCTTAGGGTACCTTCCAAG		GATATCAAACACAGGACTTAACCCA	P	TGTGACCXAGATATATTTGTGGCTTCT	TGACCCAGATATATTTGTGGCTTCTCGTCATATTTGCCTTTCCAAATTCAG
343	633	TTTTCTGGACTAAACTGCTGCG	P	CAGACTCAGAGAGATTAAGTGACTGGA		GTAAACAGTAGAGCCAGAGCCATAA	ACATGTAACAGAAAGAACAGTTATAATTATGGCTCTGGCTCTACTGTTTAC

Row#	REF#	1 Upper PCR primer	Modified	2 Lower PCR primer	Modified	3 GBA primer	4 Flanking sequence
344	634	AGGACTAACCCCACATTGGG		CTTGACTAGTTCCCAGTCGAAATTT	P	CCCCAGTCATGGGGTGATTGTCCTT	CCCCAGTCATGGGGTGATTGTCCTTGTTGAGCCCAAGGAATGATGGTGTTT
345	635	AACAGACAGACCCCCACCC	P	CAACCCCTTTCTGATTTCCC		CACAGCCACTCGGCTTCCTTCACTC	GCAGCCTGCTCAGGGAGCCAGGGCAGGAGTGAAGGAAGCCGAGTGGCTGTG
346	636	TGCAGACTCCCGCCCAGG	P	GCCAGTTGTTGAACGTGGG		GGGGTTGTGTGACTCAGAXCCTGGGCT	CCACACTGCCAGCTGGGATTGGACAGAGCCCAGGCTCTGAGTCACACAACC
347	637	CAACAGACATTGCATTGGCA	P	TGGCTTAGAACTCAGAAACCAGG		TGACTGTAGTTAAATAATCTCCTAT	TTGCTTTTGGTTTTCAGCTGTAATAGATAGGAGATTATTTAACTACAGTCA
348	638	TGACCCCTACAGACACTTAGTTGTG	P	GTGATGGTGCTGACGTAGGATT		ATTTXGGACTATCAATCCCTATGTC	AGAAGGCAGTTCTCTAGAGTGGAAAGGACATAGGGATTGATAGTCCTAAAT
349	639	GCCTCCACTTTTGGACTGACT		AGAGCTTGCTTTAAAAATGCCAC	P	ATGTGAGAAGAXTTCCTAAXTTACCAC	GTGAGAAGAATTCCTAAATTACCACGTATGAAATTAACGTCCATCTTTCTG
350	641	TTTAAAGTGGCCCTGCTGTTAC		GATTACAGGCATGAGCCACC	P	CCAGCGGXTTTAGTCTCAGGTAAACCA	AGCGGTTTTAGTCTCAGGTAAACCAGTCTTGGTCATGATTCTCTGTCTTCA
351	643	TTAGGTGTTACAAGTGATCTGGAGATG		TCTATGGATGCTCAAGTCTCTGATATG	P	TTAAAGTATGTGGGAGAATGCGGGT	TTAAAGTATGTGGGAGAATGCGGGTGGTTTATATGCAAATACTGTGAAGGC
352	644	TTTTTTTTTTTTTGAGACAGAGCAGT	P	GCAGGAGAATCACTTGAACCC		AXCCCGGAGGCAGAGGTTXCAGTGAGC	CTCTGTCACCCAGGCTGGTGATCTCGGCTCACTGCAACCTCTGCCTCCGGG
353	645	ATCCCCCTCTCTGTCACCC	P	GGTACCAGGGAAGATGAGGG		GCCCAGGAGGTGGAGGTTGTAGTGA	CTGGAGTGCAGTGGCATGATCACGGGTCACTACAACCTCCACCTCCTGGGC
354	646	TTGGGGGGAGGCAGCCAT	P	CTCAATGGAAAGTCCCGTAATG		AGGATTAAGTGAGATGGTGCCTGGT	GAGCACCTGCTCCTCACCAGGCATTGACCAGGCACCATCTCACTTAATCCT
355	647	GAACCCTGCGAATACACCCT	P	CTCATCCTCCCACCTTGGC		TTAAAATGCTACCGTATAATGTATG	GAGTCTGAAATTTATTCACACATATACATTATACGGTAGCATTTTAA
356	648	CCCACTGGAAGGTGAGCC		CAATTAACCTGGACACCGCC	P	CAAGAGACTGGGCCAACACCGAGCA	CAAGAGACTGGGCCAACACCGAGCACGGAGGGGATCAGAGCGTGTGTGTGT
357	650	AGTCTCTCCGCTTGGGTCTT		GGGTTCTGAGCCCATGATATC	P	CACTGAGCACGTGATTCCCCACACC	CACTGAGCACGTGATTCCCCACACCGAGCGAACTTCAAAGCTCCCAGTGTA
358	651	TTGTGTGTGGAGACACTGAGC	P	GCTGAAAGGGAGGTGTGATTT		ACACAGCCACGATACAATGTCAGCC	CCCACAACTGTCTCCTGCAGCATGAGGGCTGACATTGTATCGTGGCTGTGT
359	652	TGCTCCAGAATCCAAAACATTT	P	TGAGCATCCCCAATCCAA		TCTGAAATTTAGACTGCTCCAATGA	ACCAAAATGATGTTCAAAGGAAGTGCTCATTGGAGCAGTCTAAATTTCAGA
360	653	GTCCAAAATTAATCTAACTGATCCAACTT	P	AGGACCTAACTACGTGTTGTCTACAAG		ACAAGCAATGCACTTTGAATATAAT	CCCTCTACTTTTCATCAAGCTGACTCATTATATTCAAAGTGCATTGCTTGT
361	936	CTCATGAACCAACAGTATAGAAGAAATAATT		TCACTGTCAGTGGCTCTAATTAAGAAT	P	TGGTGCGATXTGGGCAAACXAGAAAAA	GTGCGATTTGGGCAAACTAGAAAAAGMCAAGAAAAATGAAAAGATCTTTTT
362	937	TGATTTTCCATACAAGCTCACATATAC	P	AAATATAACTGAGATTGGCTAACAGCTT		TTAAGACCGAATTCTCTCXAGGCAAAC	CCATGAATCCGAGACTCGAACAGATCGTTTGCCTAGAGAGAATTCGGTCTT
363	938	TCTAGTGCTGAAATTTTGGTGTGA		CAATAGCATCCTATGATCCAGCC	P	GAATTCCCTAGGCAGAAAAAAAGGA	GAATTCCCTAGGCAGAAAAAAAGGAGAGGTAGAAGGAACAGCATATTCTAA
364	939	TCTGAAATTTTGGAACAYACTGG		GTATGTGCTTAATTCCTCCAGCA	P	GTCTCTAATGAGTTTTTTCTGGTAG	GTCTCTAATGAGTTTTTTCTGGTAGGCAATGTTTTACATGTGTTGTCATAG
365	940	GCAAACAAGCCTGTGGTATAAATT	P	TCCCAATCCAGTAGACGCAG		AACTGTGCATATAAGAXTTXAATGAAG	TTTATCCACAGAAAGCAGACTGCCACCTTCATTAAATTCTTATATGCACAG
366	941	TGAAAACCAAAGCATTGATAGGG		GCCAAAAAGGCAACAGGG	P	TGCATTGAGTTGTTGGCAGAATTTC	TGCATTGAGTTGTTGGCAGAATTTCGTTCCATGGTGCTGTAGGATTGAGGT
367	942	TAGCTGGGATTACAGGCGC		GATCACTTGAGGCCAGGAATT	P	AATTTTTGTATTTTTAGTAGAGACG	AATTTTTGTATTTTTAGTAGAGACGGGGTTTGTGCCATGTTGGCCAGACTGG
368	943	ATTACAGGAGTGATTCCAGGTGC		GTCACACAGTCATGGAGACATAATACC	P	TCTGTGGGAACAGAGAGAGCATCAC	TCTGTGGGAACAGAGAGAGCATCACCGTAGTTCAAGCCAGGCTCCTTTAGG
369	944	TGCTGGGATTACAGGCATG	P	AACCTTTGGCTAAAAGGGTCTG		CTGATTACCCAAAGAGATTAGAAAC	GCCACCATGCCCAGCCGCCAAGAGGAGTTTCTAATCTCTTTGGGTAATCAG
370	945	CTCCACATTACCAAGAGGATAGGTC		GTAAAATGCTCAGCTCAGATGGA	P	AAAGCACCAATAACAACAGTAGCAG	AAAGCACCAATAACAACAGTAGCAGCTCATATTCACTAACTGCTCAACATG
371	946	ATCAGGAGCACTTGAGCCC		GACAAGGCGAGACTCTTGTCTC	P	ACCACATCCTAACATCGTAACAAAA	ACCACATCCTAACATCGTAACAAAAGGAGACCCCCATCTCTACAAAACAAA
372	947	CTGCAATTCCTGCCAAAAGT		TGGCTACTGTTGCTTTACACTGAA	P	AAAGATTATTGGAAAAXTTGACAAG	AAAGATTATTGGAAAAATTGACAAGATGATTTAAAATTATATAGAAATACA
373	948	ATATGACAGCTTGACATGATTACGAA	P	CTTTAGGATAGTAGGGCCTGCTC		GTGAGXGCTGGTGCAGACAGGACCC	GCTTATTCCAGATAGAAGCCGCCAGCGGGTCCTGTCTGCACCAGCCCTCAC
374	949	TCCATGTTGACCAGGCTAGT		AGTAAAGAGAGAGAACACAAAAGAAATTTTT	P	TCTTGAACTTGTGAXCTCAGGTGATCT	TTGAACTTGTGACCTCAGGTGATCTGCCCGCCTCGGCCTCCCAAACTGCTG
375	950	AGGAGCTGAGGGATCTGGG	P	TAGAGAAGATGCAGAGAAGAGGAGAC		AAGAGGAGACCCXTGCAAAGTCATGCT	GTGTCCCATCTTGGCCACTATTCACAAGCATGACTTTGCATGGGTCTCCTC
376	951	AAAAGGAGATCGCAGTTCGA	P	GCGTGGAATCTTGATTCGTG		TGAGAAGGAGGGAAGAGGTTGTTTC	CCGATTCCCTCTCCCCGCCGACTCTGGAAACAACCTCTTCCCTCCTTCTCA
377	952	ATGCACACACCTTGCATGG		AATAGTCAATCTGCATCCATGTCC	P	TCACAAGGGGGCTCCACCAGACTCA	TCACAAGGGGGCTCCACCAGACTCACCACCGAAGAAATGCCAGCCAACAGC
378	953	CAGGTGATCAGGAAGGACACTAG		GTGTTTTAGGTCATATTTCTTGGGG	P	GTGGATTTATATGAAAAAGGAAAAC	GTGGATTTATATGAAAAAGGAAAACGACATGCAGGCTGTCTGTACTAAGCC
379	954	GCCTTTCTGCACCTAATTCATG		TGTTCAAAATATATACTGAGGTCACTACTGA	P	CCCAAGATTTCCTCACTCCATAGTA	CCCAAGATTTCCTCACTCCATAGTAGAGTAGTTTTAAATTTTCAGTAGTGA
380	955	GTTCTATATAGGCAAACTCATTTGGACA	P	ACGGTTACCATCCCAAAGTCTAA		TACCATCCCAAAGTCTAAGAAAAAT	CAATTTTATCTTTGAATGTTCCTTTCATTTTTCTTAGACTTTGGGATGGTA
381	956	TGTGGGTTTTTTTTTAACTTGCC	P	GCCAATGGTTGCCAGGTT		ACGGAGXCTGCTGGCTTTCAAGTCTAC	TTTCATTGTCCCTCCACTGATCCACGGTAGACTTGAAAGCCAGCAGTCTCC
382	957	CTTAGTAAGCAACACAAAAACATTGGT		GCGCCACTGCACTCCAGC	P	AAGTAXACXAAATAGTATGAAATAAAA	GTATACTAAATAGTATGAAATAAAAGTCTGTTTAAATTTTTTTCTTTTTTT
383	958	ACGGTCACTTGAACCCTGGA		GATCCATTTTTAATTGAGAGATTTCTG	P	CTGTTCTCTAGCCTGGGTGACAAGA	CTGTTCTCTAGCCTGGGTGACAAGAGCGAAACTCCATCTGAAAAAAACAAA
384	959	ATAATAGAACATCTAAAGTCCAAGAAGAGT	P	TCTTCCTCCAATTCCCTCTGTAT		TCTGTATGCTXAACTGTTTTTGAATGC	TGGGCGAGGTTCATTGGGAAATTAAGGCATTCAAAAACAGTTGAGCATACA
385	960	GTACCCATGAGATCTTTCACCTACAC	P	TGTCTTAAATCCTTTCACTATAAGGACC		ACCCTTXAAAGTTGCCTAAGTTGAAAT	ATCTAATAACTGAATAATGGCAATTCATTTCAACTTAGGCAACTTTGAAGG
386	961	GAAAAACATTTCCACTGAAAACCA	P	ACCGGGGATCTCTGGGAT		ACCGGGGXTCTCTGGGXTCAGGTGAGT	TGGGAGAACTTCAGCTTTTTTTCCTCACTCACCTGATCCCAGAGATCCCCG
387	963	GCCTTTCCTTAACTAGCCTGTAATCT		ACGATTAGCCAGACTGAATGCA	P	GTAAGTACATCTTACATTTTTATTA	GTAAGTACATCTTACATTTTTATTACCTTTAGCATCTATTAGCACAATGCA
388	964	ATCTAAGGCTCCAGGGTCTCC		CTTGTGAACCCCCTCACCA	P	CAGCTCTGTGTXAGACTGAAGACCCAA	GCTCTGTGTCAGACTGAAGACCCAAGGCCCTGGTGAGGGGGTTCACAAG
389	965	CTGCTTTAAACAGTGGCTGAACTAA	P	TGGGAGGCTGTGGAGAAA		GGCTGTGGAGAAAAGGGAACATTTA	GCACCAATTATGTTTAAATGTTCCCGTAAATGTTCCCTTTTCTCCACAGCC
390	966	GTACTCAGGTTAGGTGTGGTTCAC	P	ACTTACCCAAGTCCATATCTTAGGTTATCT		TTAGXTTXTCTTTATAACCCTACACAC	TCACTTTTGCTTTAAGGGAATTCCTCGTGTGTAGGGTTATAAAGATAACCT
391	967	GAGCTTTAGAGGAACTAGACTTTCTATCCT		AGGCCATCACCATCTAAACCTT	P	GTGTTGATTCTTCTTTTTATCCCAA	GTGTTGATTCTTCTTTTTATCCCAACACTTAACGTGTGAATACATCCTGAC
392	968	ATTAAAGCAGTTTCCTAGCGTGTG	P	CAGCCAAACCTGCCTTCC		TCTGCCAGCCAAACCTGCCTTCCTC	AATGCTTTCACATGAAGGGATATTTCGAGGAAGGCAGGTTTGGCTG

Row#	REF#	1 Upper PCR primer	Modified	2 Lower PCR primer	Modified	3 GBA primer	4 Flanking sequence
			-		-		
393	970	CATCCCCCATAGTCCTGCTC		GAAAATGTGTTGGGAAAGGCA	P	GCTTCTTAGGCAAACATTTCTTTTT	GCTTCTTAGGCAAACATTTCTTTTTGGTTTGAGGCTTTTATAGCTGCAGGG
394	971	TGGAAAATATGGGAAAATGGTAATG		GGATCTTTCTGGYGCCCA	P	AACAAGTGGTTGAGCAGGGGAGGGG	AACAAGTGGTTGAGCAGGGGAGGGGGGTCATATCTGGGCRCCAGAAAGATC
395	973	TGCCTTGAAGTGTTTTTGCTG		CTCAAATAAGAGCTGTGTGGCC	P	CAGAGAGGTCCAGCCACTTGCCCAA	CAGAGAGGTCCAGCCACTTGCCCAAGGCCACACAGCTCTTATTTGAG
396	975	GGCCTAAGCCACTTGTCCTG		ATAGCTGCCTCTTCCCTTTTATAAG	P	CTGCATACTACATAGGTAAAAGATG	CTGCATACTACATAGGTAAAAGATGGGGACAAATACTTTCTATTTGCTTAT
397	977	GTGAGTAAATACAGAAACAGATGGATATTTT	P	ATGTCCATTACAGATTAGCCCACA		AGCCCXCACTTAAGTTATTGCTGTGAC	ACGGACAACAACAGTGAAAAGGATCGGTCACAGCAATAACTTAAGTGTGGG
398	978	ATTTCCTTCCTAGAAGGTCCCAG	P	GATATTTAAGCAAATACTGTAGGATAACAGCT		ATAACXGCTGAAGAGGCTGGAGAGAGG	CTGTGATTCTCTTTCCTATCATGTCGCCTCTCTCAGCCTCTTCAGCTGTT
399	979	CAAAGGAATGTATCCCTCACTCC		TGCTTAGTTACTGGTTGTCCTGAAA	P	AATTGCACCCCTAGAAAACCTATTT	AATTGCACCCCTAGAAAACCTATTTCATGGCATAATTTTTGTTCTATTACT
400	980	GTGTGGCTAGGAGAGAGATGCA		TGTCCAGGGGAAAATATGTTCTG	P	AAGAATATTAGGAAAGCAAGTTGAA	AAGAATATTAGGAAAGCAAGTTGAAAACTTCAGGAAGAAGAATGAAAATCA
401	981	ACTCGTAGCACCTTCAATGGTATAAT		CAGGAGGAATGAGGACCTTTAAG	P	AGACTTTCACACTGTTCTCTATTGA	AGACTTTCACACTGTTCTCTATTGACGTTCTCTTCTATAGTGTTGATAATA
402	982	ACCAGTAGCCAGCAATTCTGC	P	CAATAACAAACAGTGAGAGTCATCCT		TGCCAGXGCTGTTCGCCTATTCAACCC	CTGCCTCTAGAATAAATGGTTACCACGGGTTGAATAGGCGAACAGCCCTGG
403	983	GCAGAATTCACAAATATATAACCTCATAATT	P	TCATGCTTAAACATCAACCTTGTG		TGTGAATARAGTAGTAXGAAATCTTGA	ATATATAACCTCATAATTCATCGACGTCAAGATTTCTTACTACTYTATTCA
404	984	CAGAATTAGAACTGGTATATGAAGAGAGTAGC	P	GGATCAAGGACAACTCCAGGA		AATAXTAXTATXAAATTATTGAATGAT	GTATATGAAGAGAGTAGCCCATGGAAATCATTCAATAATTTGATATTATTA
405	985	TATATAAGCATACGTTGGCCCAAT		CATTTGAATATGTCAGCCTGAGG	P	GATATATAAGCATACGTTGGCCCAATGGTATTAATTTGCTTATCCATACTAAT	TATATAAGCATACGTTGGCCCAATGGTATTAATTTGCTTATCCATACTAAT
406	986	AAGGTTTATTTCAGGCCCATTATAG		GTGTGGTGCTGCAACAGC	P	TTATTTCAGGCCCATTATAXCTTTCCA	ATTTCAGGCCCATTATAGCTTTCCAACTGATCTCCTGCATTCCTTTTGGTT
407	987	TGCAGTGTCATTTGGTTCACTT		GATACTATTACAAGTTGTTAGGAAACAGTAAATTA	P	GGATCTGCAXTGTCATTTGGTTCACTT	GTACCCGGGGATCTGCAGTGTCATTTGGTTCACTTCGCTACTACTGAA
408	988	CCTGACCGAATCCCTATCTTCT		AGGAGAAAACGTATGTAAAGGATTTAGTAGA	P	TCTTAGAXTTGAGAAATAATAATTG	TCTTAGAATTGAGAAATAATAATTGCTTAATTTTAATAAGTTTCTACTAAA
409	989	CTGGACTGGATGGCCTCTG		CACACCTATTTCCTGTAGGTTTTAATTATTT	P	TTTGGGGCAAAGCTGGAAAATGAAA	TTTGGGGCAAAGCTGGAAAATGAAAGGATTTCATTTGGCAAATAATTAAAA
410	990	ATTCCACCTGAATGCACACTG		GATCTCCTGGAACAGAATGCTATG	P	CAAGACCTCAGTATCTGCTTCAGTG	CAAGACCTCAGTATCTGCTTCAGTGGTGTAACTGTGCACCTGCAGCCATAG
411	991	AGCGGCAACCTGGTCCCA		CTTTCAGAGGCAGATCTCGG	P	GCGGTGAGGCAGGAAATGGGTTGTT	GCGGTGAGGCAGGAAATGGGTTGTTGAACAGGGAGAAGGTCAGGAGCCGTG
412	992	AACAGAGTGAGACTCCGTGTCAG		CACACTCAGGGGGCTTCA	P	AAAGACAAAACTAAGCCTGAAATAG	AAAGACAAAACTAAGCCTGAAATAGCTCTTTCTGGGCCTCCCCTTTGCTGT
413	994	ATCCCCCTCTCTGTCACCC	P	GGTACCAGGGAAGATGAGGG		GCCCAGGAGGTGGAGGTTGTAGTGA	CTGGAGTGCAGTGGCATGATCACGGGTCACTACAACCTCCACCTCCTGGGC
414	995	TTGGGGGGAGGCAGCCAT	P	CTCAATGGAAAGTCCCGTAATG		AGGATTAAGTGAGATGGTGCCTGGT	GAGCACCTGCTCCTCACCAGGCATTGACCAGGCACCATCTCACTTAATCCT
415	996	CCCACTGGAAGGTGAGCC		CAATTAACCTGGACACCGCC	P	CAAGAGACTGGGCCAACACCGAGCA	CAAGAGACTGGGCCAACACCGAGCACGGAGGGGATCAGAGCGTGTGTGTGT
416	997	GCAGGAGACTCGCTTGAAC		GTTTCACGCTTGTTGCCC	P	CCTGCGAGXCGGAGGTTACAGTGAGCC	TGCGAGGCGGAGGTTACAGTGAGCGGAGATCGTGCCATTGCACTCTAGTCT
417	998	CTGGTGAAAATTAAGTTAGCAAATGAA		CCTTTATTAGAAAGGAGAGTTAAATGTTGTATAC	P	CACTTCCATATGGTTTCTTTTCTCC	CACTTCCATATGGTTTCTTTTCTCCGACATGGGACTATTCAGTTGACCTTT
418	1000	CGTCCTTAATTTGTTCTTTGTAGCA	P	ACTGAAGCCTGCCAATGAAC		CATGCAATACAXATCATTTACTAATAT	TGGTGCAGTAGAATAGACCAACCTCAATATTAGTAAATGATTTGTATTGCA
419	1001	TCCCCAGACATGTGGAATTG	P	CATTTTTAGATGTCTTTACAGCAATGC		GCTGATAAAGACATAACCXAGACTTGG	ACTAAACCTCTTCCCTTTATAAATTACCAAGTCTTGGTTATGTCTTTATCA
420	1002	AAAAATGCTGGGTGAAAGAAGC	P	CAATCGGGACTCCTACCAAATT		ATTCCCATCCAGXTTTACCAACAGGCA	GAAGTAGAAGATGGATCATTGGAATGTGCCTGTTGGTAAACCTGGATGGGA
421	1003	CCAGGAGTAGGGCATTGCTAT	P	CCTCATCTTTCTGTCTTTTTCTAAGC		AAACTGTTCAAATCTCTGCCCATTA	AAGATACCTGACACTTTAAAACTGGGTAATGGGCAGAGATTTGAACAGTTT
422	1004	GAATCACCTGTCTGGGTCTCAA	P	GATAATTCAGAGAAGGATTGTCCACA		ATTGTCCACXTTAAAATGXTCCCTTAC	AATGGAAGTGCTTTAGCTTCACTCAGGTAAGGGATCATTTTAATGTGGACA
423	1005	GCATTTCTGAGTCCTCCTCAAG	P	AATTTTCAATGAGATACTGGCTTCTATTT		GGCTTCTATTTTGCTTATTGGTTTG	AGAGTCAGGCAATCCTCAGTCATGTACAAACCAATAAGCAAAATAGAAGCC
424	1006	TTAAAATAACTACAGTCATTCCAGTGGAC		TTTAGATAAAATCCAAAACTCTTCCTCTC	P	CAGATGCAAGTYGGAGAACCXTCAGGC	GATGCAAGTYGGAGAACCCTCAGGCGGAAGCTGAGCATAGTAAGAAATTGG
425	1008	AATTGGCTGATGCAAAGAAGAA		GACAAATGACTTACAGATCCCCC	P	AAAAAGGTACATCAGAAACAGAAAC	AAAAAGGTACATCAGAAACAGAAACGTGCTACTATCAGGGCAACTGAGCTT
426	1009	AGGTGTGAGCAGGGAGTGG	P	GGAAATAGATATGGAATATTTCAAGAATCA		TGTGCAGAGCTCTGAYGGCTGGTGA	TGGCTGAGGCTGGGCAGAGCACAGGGTCACCAGCCRTCAGAGCTCTGCACA
427	1010	TTCCAGCTCTGGGACCAAG		GTGCAGCCTCCTGGAGAAC	P	GCCAGGCGTCCATCACTCCCTCTTC	GCCAGGCGTCCATCACTCCCTCTTCCGGAGCTTCCATGGAATGACGGCCTG
428	1011	TTAGCAGTGGCAGGTTTAACATTC	P	GCTAAGAGTTTTTTCTAGTGTACCAGCC		AGTGTACCAGCCTCACAGCXTGATTCA	CATTTATAATTGCTGAGTCATGAATGTGAATCATGCTGTGAGGCTGGTACA
429	1012	TGGAGTGCAATGGCGTGA	P	CCTAGCTGCTTGGGAGGC		TGAGGCATAAGAATCGTTTGAACCC	TCGGCTCACTCCAACCTCTGCCTCGGGGTTCAAACGATTCTTATGCCTCA
430	1013	GTGGTTGATCTTAGAGTATATTCCATGTG		ACACTTAAGCAAATGGACCTAATAAACA	P	AAAGAATGTGTATGTTGTGGTTGTT	AAAGAATGTGTATGTTGTGGTTGTTCGGTAGAATGTTCAGTAGATGTTTAT
431	1014	AACATTTTCCAGCATAAACTCTTTTC		CAGAACAGACAAGGTTGGGTG	P	ATCACCTCATCTCACCTTCCTCTAA	ATCACCTCATCTCACCTTCCTCTAACCACTCAGGATTCATGTCAGCCTAGT
432	1015	TCTGACTCCTCACCTCTTCTGC		CAAAGACCCTGGGGTGGG	P	CATTTTCCAAACATGCCTTCTTCCA	CATTTTCCAAACATGCCTTCTTCCAGCTATTAAATACTTGAATGTACCGGG
433	1016	TCCTAAGTCCCTCAGCAGAAAAA	P	TCCTTAGTTTACAATATTTACCATTAGTGTCTG		GTAAGCAATTTGACTTSTATACAGA	TTTGAAAACTGACTCTGGTGTGTACCTCTGTATASAAGTCAAATTGCTTAC
434	1017	TTTGAAACTGGATAATAGGCAGAGG		GACTTCACTGCCCATGTTACTATCA	P	TTGAAACTTCCTAGAAACTTGTTGA	TTGAAACTTCCTAGAAACTTGTTGAGTGGTTGTGACCAAAATACTGATAGT
435	1018	ATGCACCTCCACTGAGCTG		CAGCCACTACCTGCATGGG	P	GAGXAGGACAGTGGCTTCTGTACTGCT	GAAGGACAGTGGCTTCTGTACTGCTAACAGACCCCATGCAGGTAGTGGCTG
436	1019	CCTGTTTTTCTGTGGCTAGTGAG	P	GTTTATCTGTCTAGTGACCTTGCAGC		CACAGCTAGGGAAACAGGXTCTTCACA	CTTATCTCTCCTCCTTTCCCAGGCACTGTGAAGATCCTGTTTCCCTAGCTG
437	1020	ACTGGACACACTACAGATTTGAACAA		CTTTTAGCAGCTACATGCAAAGAAC	P	CCCAAAGGTCTTTGGCAGTCCGTCT	CCCAAAGGTCTTTGGCAGTCCGTCTGCTTTCTTTAGGGCCTGGAAGTTCTT
438	1021	AATGGTGGCTCATAATAGAAACTAAATTT	P	AGCTCATTTTGGGAGTATGTATGTACA		TATXTGTAACAGATTCCAACCACAGAG	TGCCACTTCTTTTGCACATTTGAGTGCTCTGTGGTTGGAATCTGTTACACA
439	1022	AGACACACAGACCAATAGAACAGAATAG		TTATTGAAGAGGCTGTCTTTTCTGC	P	CTCAGAAAAAAATCCACACACCTAC	CTCAGAAAAAAATCCACACACCTACAGTGAACTCTTTTGACAAAGGTGCCA
440	1023	GGTACCGGGGATCTCTGC		TTGCTTTGGAAAGTATGGCC	P	CACATGGAAAAACACTTTATACTAC	CACATGGAAAAACACTTTATACTACGGATCAGAAGAATCAATATTGTTGAA
441	1024	GCAATTCTCTTTCTATGACAAGGTCA		TGCCAGGAAATTAAAATCAAGTTAGA	P	TTTCAGCCTCTGATTCCTTTATTAT	TTTCAGCCTCTGATTCCTTTATTATCACAATTTTCTACTCCTGCTCTAACT

Row#	REF#	1 Upper PCR primer	Modified	2 Lower PCR primer	Modified	3 GBA primer	4 Flanking sequence
442	1025	CACTGGCCTGTGAGCCAT	P	ACCAAATGGCAACAACTACTCTG		ATTGTCTTTTAAGAGAAATCAAATA	TATAGATCAAAGAATTCACTAGAGCGTATTTGATTTCTCTTAAAAGACAAT
443	1026	ACTATGCATCCTGTGAACCCTG	P	GTATCTTTATAGCAATGCCCCACC		TAGATAAACACCTGAGATAGGGTAA	CCCATTAAACCTCTATCATTTATAAGTTACCCTATCTCAGGTGTTTATCTA
444	1027	ATGTCTGAGAAGGTAGGATCTGGC	P	CAGATACTCATACCTGTACTAGATTCCTCC		AAAGACTCAGATCCTCATACCAGGG	TCCATGTCTGAGGACGTAGAATCTGGCCCTGGTATGAGGATCTGAGTCTTT
445	1028	GACCAGTGAAATGCAAGTCTCAG		AGTAAAGGCTGAAAAAGAAGACTTTAATG	P	GAAAGTTTTCATTTCTATCCCTGAT	GAAAGTTTTCATTTCTATCCCTGATGCTGATCCATGCATCCATTAAAGTCT
446	1029	ATCCTTGCCTAAGCATCTGTGT	P	GAAAAATGGACAGAAAKGAAGCTATT		TTCGTCTTAAGACAGXACACACACAGA	TGCATGTGTGAGTGTGTGTAGGTGCGTCTGTGTGTGTACTGTCTTAAGACG
447	1030	ATTTTTTTTTGTATTTTTAGTAGAGACGGG	P	GGCTCACGCCTGTAATCC		CAGCACTTTGGGAGGTCAAGGCGGG	TCTCGATCTCCTGACCKCGTGATCCGCCCGCCTTGACCTCCCAAAGTGCTG
448	1032	CTGGTATTCCCTTCATGAGAATTTT		AGGACAGTAGGAATGTTGGAATAGAC	P	AATGCCTTGGTAAAGACAGTTTTCT	AATGCCTTGGTAAAGACAGTTTTCTCCAAACTCCCTGAGAGGTAGGTCTAT
449	1033	TGGTTTCCTGTGTGGTAGTTCTTT		GAAAAAGAAGAATTAGATTGGCACC	P	TTCCGTCATCTGTTTATGTTATTCC	TTCCGTCATCTGTTTATGTTATTCCGCACTCTTTYAGTTTTCAGAGCAGCA
450	1034	GTTCCCAAGGGTACTGGGTG	P	AGGGTACATGGAGACCTGGG		AGCTGAATTAGTATAXCTTACAAGTAT	AAAGGGAGAGAGTCTTTATAATTTACATACTTGTAAGCTATACTAATTCAG
451	1035	TTTTGTGTGTGTGTGTGTGTG		GAGACCTTTTATGTTTTGCTCTAACCT	P	TGTGCCTGATCTCTTGTGTTTTGAG	TGTGCCTGATCTCTTGTGTTTTGAGGTCCTAGTGAGGAAATGAGGTTAGAG
452	1036	TGTAATGGTCATGGACAGTGATG		GACTTCACCACGAGGGCA	P	TGGGAAGTAGTGAGTGATGGTGGGG	TGGGAAGTAGTGAGTGATGGTGGGGAGCCTAGACCTCAGGTCATGGAGCCA
453	1037	TGCTCAGTAAGACCCCAAATTTT	P	ATATAGTCGTTATAACAACAGCTTCAAAGTC		CAGCTTCAAAGTCAAATAGACAATG	TCCCRTGGCAGAACTTTGATTGAACCCATTGTCTATTTGACTTTGAAGCTG
454	1038	ACCCAATTCATACCAAATACTCTTCTG	P	ATAACAACAGCTTCAAAGTCAAATAGACA		AATGRGTTCAATCAAAGTTCTGCCA	AAGACCCCAAATTTTGTCTAATCCCGTGGCAGAACTTTGATTGAACYCATT
455	1039	CAGGGCAGAAAATCATAACAATG		AAAAATGCCTCCAACCTTTACAC	P	TTCTTCCTAGGGCTGAATAACCAGA	TTCTTCCTAGGGCTGAATAACCAGAGTGATTTAAGAGCTAGGGAATGTGTA
456	1040	CTCATCAAAAAGTGGGCTAAAGATAT		ACGGCCATTCTTGCAGAA	P	GAAGGTATACAAATGACAAAAAAGT	GAAGGTATACAAATGACAAAAAAGTCATGGAAAAATACTGAATATCACTAA
457	1041	CAATGTAAGAGTTTCTACTCTCATTTTTCTG	P	CTGAAGACCCCATCATAGTCTTTG		TTXTCTCAGCATTXCAGGGGGTGAAAG	TTTAGGGCTCAATGCTAGCCATCATGCTTTCACCCCCTGAAATGCTGAGAA
458	1042	CTCACCACTGCACTCCAGC	P	CACTACCAGTTTCTTATGTATCCTTCTAAAG		TCCTATACTTAAGAATACAAATATA	TGTGTATTATTTATATGTAATTTCTGTATATTTGTATTCTTAAGTATAGGA
459	1043	CCTTTTGATGTTTGGGGTTTTC	P	TGTTCAAGGACAAGGTATCCAAA		AACAGCCTXGACTTAXTTCAATGAGAC	TTTTCCCTGAACTGAACTGATATTCCGTCTCATTGAATTAAGTCAAGCCTG
460	1044	GAACTTCAACATGATAATAAAATTCACCA		TGGGAATTCATTTGGCTTCC	P	ATAAACXTAACTGAATAAGAGCAATAA	AAACTTAACTGAATAAGAGCAATAACAATTTTTAAAAAGCTTAAAAATGTA
461	1046	CCAACTATAAACTTTACCTATGGAAAAATG		TGGAGCACTTTAAAAATATTATCTCACTG	P	AGTGTTGGGCCATTAXATGXTCTCTTA	TGTTGGGCCATTAGATGATCTCTTAGTGCTCACCTATTTTGAGACTTCAGT
462	1047	AGGCAGAATCAAAGGCTTCT	P	CGGCATGTAAATAACTTTTTAGGGA		AACGGGCCATACTAACAAGTGCTGC	GGATCTTTCCAGGCAGAATCAAAGGCTTCTCGCAGCACTTGTTAGT
463	1048	CATTAAGCCTTTCACTGAGAGTAGAGAT		AGCTGGAAGGGTTTTGAAAGAT	P	ACTTGCAGTTGCCTCTCTGACACAA	ACTTGCAGTTGCCTCTCTGACACAAGTATATCTAAGAAATCAACATAATCT
464	1049	TTCAATAATGAGAGGGGAGAAG		CTCTCAGCTTTTTTTCTTGCTACTTG	P	TGGXAGGXAGTGGGCTTCATATTCATT	GAAGGAAGTGGGCTTCATATTCATTCGCACAGCTCCTCTCAACCTGGCCCC
465	1050	CGAAATGGCAATTTGTCTGAA	P	CATATACACAGGTATTGTTTCCAAAGC		AACATACTCTGCCCATTCCAGCCTT	ACCAGCACTTAGGTTATCATATTGGAAAGGCTGGAATGGGCAGAGTATGTT
466	1051	TTGCTGTTTTTGAGCTCTATATTACATAAA		GGCATTAGAAATTGGAGTAAAGGC	P	TTGAGCATAAACAAAATCCAAACAA	TTGAGCATAAACAAAATCCAAACAAGTTTTTTGCCAGTTGATAACATGGAT
467	1052	CTTCTTTGGCTATCATTTGGACAT		TGGTATGAGTGTGTGTTKGTGTTTTA	P	CCATTTCAAACATAATAGTCAAAGA	CCATTTCAAACATAATAGTCAAAGAGAAGAAAATGCTCTATTCATTAAAAC
468	1053	GTATCAAAAGTGTCAATTCCCAAAGA	P	ACACACACACACACACACACAATC		CTACCTTTWTAATCTAXATTGACCCAC	TATGGGATTAGCATCTAAGTGTCCTCGTGGGTCAATATAGATTAWAAAGGT
469	1054	AAGGTATCTTCTTGGCTCCAGTAAA		CCAAGGTCACAAGCTAGTCTTAGC	P	AGCACCAGGGCTAGGAGTTCAGAGA	AGCACCAGGGCTAGGAGTTCAGAGACGTGGCATTTCATACTGGCTAAAGCT
470	1055	TTTGGAAGGCTCAGAAAAATACAG	P	CAAAGACATTCAGCAAGTCTCTAGAAA		GTCTTCAAAGCCCTCCAAGTCTCTA	AAAATGTGGGAAAGTTTGGAACTTCCTAGAGACTTGGAGGGCTTTGAAGAC
471	1056	TATGACCAGTGCCTGTCTTAACTG	P	TATTTGAAGAACAGAAAAGTCTAGTGAAGC		TGAAGCCAGACAGCAGTAATCAGGA	CCAGCTTCAGTGTGCACCAAACTCACTCCTGATTACTGCTGTCTGGCTTCA
472	1057	AGCTACTAAGAGTGCTGTGACTTTAAACT	P	CCATGCAGTTAAAAAGAAACTCG		TCGCCAGAGACTCACATCCTACCCA	AAAATAAGTGGCAAACCAGTGGTTTGTGGGTAGGATGTGAGTCTCTGGCGA
473	1058	AGGCAAGGCTGAGTGCGC		GAAAAAGAACCCTTAAGAAAAGATGC	P	AAAATGAGCTTGTTCCCCTGAGGAG	AAAATGAGCTTGTTCCCCTGAGGAGGTGTGACATCGCTGTCCACCCATCAC
474	1059	CTTTGGCTGTGTACTGATTTACACATAT	P	CATTTTAACTGTTGGAATCACAAACA		GCTCTTTAGCCTACTXCTTTCCAGCAG	AAAAGTACCCAAGGCCGGGGGGGAAACTGCTGGAAAGCAGTAGGCTAAAGA
475	1060	GGAACTTGATATGTCTGAAAGCAAA	P	TTCCGAATTTCTTTGGAAGATGT		GATGTTACTGGTTGATTTCCATTTG	AAGTGGAAAGTCTTTCAGAATAATGGCAAATGGAAATCAACCAGTAACATC
476	1062	TTGTTGAATGGTTGTAACCAAAATG	P	CTTTGCTAAAGCATACCAAGAGTGA		TACTCCAGTTCCCAACAAGTTCTGC	AGGCTGAGGTGGTCTCAGCTGGAGACGCAGAACTTGTTGGGAACTGGAGTA
477	1064	CTAAGGCACTGGTTCATTACTACATAATG		TCTCAACAAAAGGCTTTGATATGG	P	GGAATAGTTGAGCTAACCAATTCAGAGGCATTCTCTAGAATATAGTTAAATTT	
478	1065	TGTGGCTCCCCTGAGTATTC	P	GCTCAACTATTCCAATTTACTCATTATGTAG		TAGTAATGAACCAGTGCCTTAGATT	GAAAATTGTGGGCAGATATGGTGGTGAATCTAAGGCACTGGTTCATTACTA
479	1066	TATGTCAGGCCCTAGTATGTAGTATGAGT	P	TATGAATCTGAAATCCCCATCATC		AGGATATAAGCTCTCTGAGGGCAGG	CAGTGGTGAACAGGACAGATATAGCCCCTGCCCTCAGAGAGCTTATATCCT
480	1067	RGGCATGGTGGCAGACAT	P	CTCATTGTAGCCTCCGCCT		CCTGGGTTCAAATGATTCTCCTGCC	ATAATCCCAGCTACTCAAGAGGCTGAGGCAGGAGAATCATTTGAACCCAGG
481	1068	CACAGAGTTCCCCTCCCC		GTTTCAACTTACAGGAAAATGAGGG	P	GCTCTGTAATCTTGTCTGCGGAGGC	GCTCTGTAATCTTGTCTGCGGAGGCGATTCCAGGCTTNGCTGGACGGCCCC
482	1069	TGCTCCTGCTTGAGCCAG		GTAACCGCAGATCTTGGAGG	P	CTTTCCCAATATAGACAGACGAGAG	CTTTCCCAATATAGACAGACGAGAGGTGAGCAGGGTCTGCTTGATGAAATT
483	1070	CCAGGCTGGTCTCGAACTTAC		ATAAAATAATTTTTAAAGGTCTGTTTAGGGC	P	TCAGCCTCCTGAAGTGTTXGGATTCCA	AGCCTCCTGAAGTGTTGGGATTCCAGGTGTGAGCCACCACACCCAGCCCTA
484	1071	TTTGGTTTCTCTCCGGTTGG		GAATATTTTTCTTCTTGGGAGAGGC	P	CXTGAAAATATCAGATCCCTCATGAAACGTGGCCATGGCTATATTTGCTACACT	TGAAATATCAGATCCCTCATGAAACGTGGCCATGGCTATATTTGCTACACT
485	1072	CAGGGGTCTGTGAGGTCAGA	P	ACAAGAATATGTAAATACTCATTTCATTAGTCAC		TCATTTCATTAGTXACAAAAGTGAT	GAGACTACACGCCATGTAATCGCATCATCACTTTTGTCACTAATGAAATGA
486	1073	AAGACCCTGACTCTAAAAAGCAAAC	P	CTATGTAAGGGTTAAGGTGGCTAGTCT		GATTCGGTACAGGTTTTACXGCTCTGT	CTGAAAAATGTGATTGGTACCAAGAAACAGAGCTGTAAAACCTGTACCGAA
487	1074	GTGGTTCATGCTATACCAAGTCATT	P	TGAGAATTTGTAACACTTTTTGCTTAGTC		AAGTTTTATTTTTGCCTTTGTTTCA	GGTCAGCATATAGAACTTATTTTGCATGAAACAAAGGCAAAAATAAAACTT
488	1075	CTGCTGTTAGTCTAATGGGATTCC	P	TCCAATTTTCCAAGGCTGAA		TGAAATAAAAGAAAGTATGXTAAAGGC	TAGGTAACCTGCCCTTTCTCTCTAGCGCCTTTAACATACTTTCTTTTATTT
489	1076	CCAACTTGTTTGCTTTCTCCC		TGGTTCTCAAATAAGACAGACAAAAA	P	TAAATTTXGCCTCTTTACAATCCCA	TAAATTTGGCCTCTTTACAATCCCACATTTCTCAAAGGTTTTGTTTCTTTT
490	1077	AGTCTACTGTTTATTTGAGAAATGGCTT	P	TAGTTATTTTCTTACCACTAAGGTTATAGGGATAT		ACTAAGGTTATAGGGAXATGAAAGAAT	ATGTGTATTTAGCTAAGAGTTTCTCCATTCTTTCATATCCCTATAACCTTA

Row#	REF#	1 Upper PCR primer	Modified	2 Lower PCR primer	Modified	3 GBA primer	4 Flanking sequence
			-		-		---
491	1078	GTTTCTGGMACTTAATGATTTTTCAAA	P	AGCATAAGGATGGCATAGGATTC		GATTCAAGGATTTTTTTTTCTGTAA	TTAGTTTCTTCTTGGATATTAACAGCTTACAGAAAAAAAAAATCCTTGAATC
492	1079	TGGTGACTCACGTCTGCAAT	P	CTGACTAATTTTTGTATTTTTAGTAGAGAATGG		TCGAACTCCTGACCTCAAGTGATTC	CAACACTTTGGGAGGCCTAGGTGGCCGAATCACTTGAGGTCAGGAGTTCGA
493	1080	AAAAACAACAGCAGCTCCACA	P	GAAAGATAAGGAAACTCAGCTTTGG		GAACATTGCAGATCACACAACCCAC	TTCCCAATGCTCTTGAACAGGTCCTGGTGGGTTGTGTGATCTGCAATGTTC
494	1081	CTTGCTAGAAACTTGTTAAAYGGTTGT		AGTTCCTTATTTCCACCTGAGACC	P	GATCAAAATGCTGATAGTGXTATGGAC	TCAAAATGCTGATAGTGATATGGACAATGAAGTTCAGGATGAGGAGGTCTC
495	1082	TGAATACAACACACACAATGGAC		CTTAGACCGGCCTCGGAG	P	TTCCACACCAGCGAAAGAGGGAGACGCAGACAGGCCGCACCGGGCCTCCGA	
496	1083	CTATCATGCAGTGAGATATATGGTTGTAA		TCTAGACAAGTGTAATTATAGAAAGAAAGTGAAA	P	CTTGGTATACTGCATCTCTXAAAATGG	TGGTATACTGCATCTCTTAAAATGGGGGTTATTTGTATATGACTAAATAAC
497	1085	GAGAGGCACTAAACAGACACTTAAATT	P	TCTTTAAGCCTCCAGCAGTGC		AGAXATTTAATTGATTTTTTTTATTTA	AATAAAAACCTCAACTTTTAGAAGATAAATAAAAAAAAATCAATTAAATTT
498	1086	GGACATGGCATATCTTTTCATTTTT		AGCACAGAAAATTAACTACTTAGGAAAAAA	P	AGTTCTCTTCAATTTTCTTCATCAG	AGTTCTCTTCAATTTTCTTCATCAGAGTTTTATAGTTTTTTTTGTAGAGAT
499	1087	ATTTGTATTTCAGATCCATCTAGACTCCT		GGAGAGACTACGTGAGGGTGG	P	TCTCTTCCTGGTGACCXTGTTGCTTCC	TCTTCCTGGTGACCATGTTGCTTCCCCTCTCTAGGGTTTTCCCAGCCCCCA
500	1088	TGCAGTCCCAGCTACTTGG		CTTGGAGTACAGTGACATGATTATGG	P	GTGGAXGTGGGAGAATGATGTAAGCCT	GGAGGTGGGAGAATGATGTAAGCCTAGGAGGTCGAGGCTGCAGTGAGCCAT
501	1089	GCATTCTCCGAGTTTGATTATGTT		AAAATTCACAGTTTAGGCCAGTCA	P	ATGAGAAAAAAAGTGTTXGACTCTACA	GAGAAAAAAAGTGTTAGACTCTACAGGCATAAATATTGAAAAAACTGACTG
502	1090	TTCCCTGTACCCCACCCC	P	CATAAAGCAGAATGTGGTGTGTG		GCTCACTGGXAAAGATXCTTGGAACAT	TGCTCAACATGTTCACACAATTCTCCATGTTCCAAGGATCTTTCCCAGTGA
503	1091	CAGCATTCGGTGAGAGCAA		TAAAAGTTTGGAGCAAATAACCCA	P	CAAAAGTAGCTGTCGGCTGAACACA	CAAAAGTAGCTGTCGGCTGAACACAGGAGTTCATGTGTACTTTGTGACTGA
504	1092	CCTGTTTCTGGGCTCGACA		TTTTTGCTCCTATTGTATATGTAGAAACTG	P	TGTATCACCCCTAACAAGTCATTTT	TGTATCACCCCTAACAAGTCATTTTGCCCATTGGAACTTCAGTTTCTACAT
505	1093	CGGTACCCGAGAGGATCTG		TTCTTTGCTTTTTGTAGTGTAGGAAACTA	P	CAAATCXCTGCTGTTTCTAAGTGAACC	AATCACTGCTGTTTCTAAGTGAACCGTTATACTTAGTTTTATGTAGTTTCC
506	1094	TTYATAATAAGAAGGCCCTGGGT		CTTGCTACCAGCTTGAGGCT	P	CTGCTTCTCTGGGATTCTCTCATTC	CTGCTTCTCTGGGATTCTCTCATTCGTACCTCTCTGTTCATGATGCTGCAG
507	1095	TAGTTCCAGCAGGGGCTAGAA	P	CTCTTTAAGTGTCCTCCCTGGG		TXTCCCTCTGAATTAGAAAXCTCTAGT	ACCAGAAACCAGTTCATCAAGCTAAGACTAGAGCTTTCTAATTCAGAGGGA
508	1096	CAACCAGAGGATTCAACAGAGTT	P	CAGCGTGGTGCTTCATGA		CCTGGCCACTCTCGCAGAATAGTCA	AAGGAGCCTGACGGTTTCACAGAGTCTGACTATTCTGCGAGAGTGGCCAGG
509	1097	CTTTCTGATTGTTACACTTTTTTTTTCC		CAGGGGAATTGCTTGGACC	P	CXAGGCTGGGGTGXAGTGGTGCGATCT	AGGCTGGGGTGCAGTGGTGCGATCTCGGCTCACTGCAACCTCTACCTCCCG
510	1098	TACCGGGGATCTTATCAATAGTGA	P	CATGAGACCTGCCAGGAAAA		CTTTGGTCTGACCTGAGAGXTCATACC	GAGTCCAGCTCCAGGTTGAAGTCCTGGGTATGATCTCTCAGGTCAGACCAA
511	1099	TCAGGTCAGACCAAAGGCA	P	CTTGAATCCTTGACTGCACCTC		ACACTACGATGTGGGGAGGACAACT	TTTTCCTGGCAGGTCTCATGGGAGAGAGTTGTCCTCCCCACATCGTAGTGT
512	1100	CTTGTGAGTTCAATTTTTTTCTCTCTC	P	TTTTATCCTGGGTTTCTAAATTATTGC		TAAATTATTGCXGTAAACTGATTACAT	CTTCAAAGAAGAGCCCATATGGGAAGATGTAATCAGTTTACTGCAATAATT
513	1101	ATTAGAAACATCCTTCCCAGGC	P	GTTTTGTTCACTTGTCTCAGAACATG		GAAAACCAAGGGAGAGAACAAACTC	GGACTATCATCATCCTGCTCCCTCTCGAGTTTGTTCTCTCCCTTGGTTTTC
514	1102	GGCATCCCAGAAGACATCTC	P	TTTTATTCCTAGAAAATCCTCCTTTCC		TCCTCCTTTCCTTCTAXCACTCTGATC	AGAAGATAGCGTTAACATATCTAAAAGATCAGAGTGATAGAAGGAAAGGAG
515	1103	CGGGGATCTTTTCCTTGTATTA	P	GTTGTTAGACTCGTGGGACGAC		CACTGTTTAAGGGTAGTTGTGGTGG	TTTGATAGCCTSTGACACTAAGATGGCCACCACAACTACCCTTAAACAGTG
516	1104	TGCCTCAGCCACCCAAAG		TTCAGTTCACTTGCCCACTTTT	P	TGCTGXGATTATAGXCACGAGCCACCC	CTGGGATTATAGGCACGAGCCACCCGTGCACAACCAACAATTCATTTAAAA
517	1105	AACGTGGAAAGGACCACAGC		CTTCCACACAGGTGTACCCAC	P	AGGACACCTGAGCTCTCCAACAGAC	AGGACACCTGAGCTCTCCAACAGACGTTTAACGCCAAGGGATTCACAGGTG
518	1106	CTAGCATTTCTCTGAAGGATAAAACAAA	P	AGGGYCAATGGAGATTGCA		TTTTAATTCATTGAAGTTATTTTGG	CAAACAAACAAATTAACAAGAAAAAACCAAAATAACTTCAATGAATTAAAA
519	1107	AATCTACAGCATCAGAAAGACTTGTCTC	P	CTACTTCTCGCCTCCYAAAGTGCT		AGTXCTGGGATTACAGGGATGAGGCAC	AATAATCAGAGCTCTGGCCAGGCGCGGTGCCTCATCCCTGTAATCCCAGCA
520	1108	CTAGAGTTGTTTCAAACTAAAAATGGT		TTTCTCTCAGTTTGTAGGCTCAAAA	P	TCCATACGGGGCTAAGTGAAATAAG	TCCATACGGGGCTAAGTGAAATAAGGTTCCACCTAACAATCTCTAGTTTTG
521	1109	GGTTGTGTGTTTCTAAGGATTTGG	P	ACCAGAATAATTCTAACCAGAAAGGAA		AGAAAGGAAAAAGACGCATTAAAAC	TAATACATTTTTAAAAAATAGAATCCGTTTTAATGCCTCTTTTTCCTTTCT
522	1110	CTGACACATAAAGAGTCCACACATTT	P	TTGTTGTCCTGGTTTTCAATAATTT		ATAATTTGGTTCTATTTTCTAACAT	AGCATGCAACAAAAAAATTACCAGGCATGTTAGAAAATAGAACCAAATTAT
523	1111	CCTTTCACAACACGAGGGG	P	AAGAGATAAATAGGAATGTGTATGGGAA		GTATGGGAAATTGTGAAGTAAAAGG	AAACCATATCACATTTTTAAAAATTGCCTTTTACTTCACAATTTCCCATAC
524	1112	ACACGTTGGAATTATGGGAGC		CATGTGGTCTTGAAGGGGTCT	P	GTAAGATTXGGATGGGGACACAGCCAA	AAGATTTGGATGGGGACACAGCCAAACCATATCACCTCCATTGAGCTTACT
525	1113	ATTCCCCAGCCATGCTAAAC	P	TACATTCCAGCCTGGGCA		AAAAAATAAAAGTAAAGACATACCC	CTTTCCTTTATAAATTACCCAGTCTCGGGTATGTCTTTACTTTTATTTTTT
526	1114	GTGGGGCTCAATACTCATGCT	P	TGTGACTAAGTAAAAAACATTGAGATTATCC		AGATTATCXTGATTTATCXTTATAGGT	TTCAAGAGCTTTTATGATCACATTACACCTATAAGGATAAATCAGGATAAT
527	1115	GAGCTATCTATGACAAACCCACAGA		TGGTGAGAGTGGGCATCC	P	CATCATAACGAATAAAATCTGGAAG	CATCATAACGAATAAAATCTGGAAGGATTATACTTGATAACTATAATAAGA
528	1116	GAAGAGGCATTCTATTTCAGCAAG	P	TGCAGCATAAAAGCAAGAGGG		AGTGGCAGGAGAAAAACTCAGGTTA	GGTTTTCAGAAAAAAAAAAAAATAAGTAACCTGAGTTTTTCTCCTGCCACT
529	1117	CATTTGTTAAGTCTCTTTACAAGGCC	P	TGGGCAAGGACACAGATG		GCAXACCATACCATGATGTTTACTTTT	TGTTCCTTTCAKAGTCAGCAAATAAGAAAAGTAAACATCATGGTATGGTTT
530	1118	GTGGACATTCAGTACATTTGTTAAGTCTC	P	ATGCAAACCATACCATGATGTTTAC		TGTTTACTTTTMTTATTTGCTGACT	TTACAAGGCCCATGTGTTCCTTTCAGAGTCAGCAAATAAKAAAAGTAAACA
531	1119	GTCTCTCTTTCTGAAAATCATAGAAGGAT		TGCAGAACATTCTTTTTTTGGC	P	AAAAGTTCCAAGTCAAACACATTCA	AAAAGTTCCAAGTCAAACACATTCAGCTTTCATCCTTTAAAAATGTCATTA
532	1121	CATCTTTTTCTAGTTGTGGCTTATCTTT		TGGGGAAAGTGATGAGGATTT	P	TCACACAATTXAAGCTGATATTTAAGA	ACACAATTTAAGCTGATATTTAAGAAACAAATTCTTAATTTAAATAAGATT
533	1123	AGGTGAATGGGAAGCAGACATAT		GTACCGGGGATCTGGTTGTT	P	GGTGGATCAGGAGAGAGAGAGTGGA	GGTGGATCAGGAGAGAGAGAGTGGAGGGGGAAGTGCTACACACCTTTTAAA
534	1125	GCAACAAACTTGCCAGCTC	P	GCTGCTATAACAAAATATCTGAGACTGG		AAAXAACAGAAATGTACTTCTCACAGT	TTGATCTTGGACTTTCAGCCTCCAGAACTGTGAGAAGTACATTTCTGTTCT
535	1126	AATTCAAGATGAGAATTGGGTGG		GAATTRAAAATGAGACAGCCAGC	P	GATGAAGCTTAGGTGACAGATTTTG	GATGAAGCTTAGGTGACAGATTTTGAACATGAGACCAATCCACCCACAGAG
536	1127	CACAGGCAAGTAATTCATTTTGTG	P	ACAGTTTTCAAGGTTATAAATGACTGTCTT		ACTGTCTTCCAAAAAAAXCTGATGACA	TATTTCTTGAATGGGGCAGAAAGTTATGTCATCAGCTTTTTTTGGAAGACA
537	1128	TCCTAGATGACCCCTGGCTT		CGGGGATCTGCTCGGGTT	P	GGCTGGTGAGCCTGGGGACTTGGTG	GGCTGGTGAGCCTGGGGACTTGGTGGGAACTTCTCTGAGAAAGGGAAGCAG
538	1129	CCCGTATGGAATTTCAGACTACTTT	P	ACAAGTGATGGTTAACTACTAAAAACTGAATAA		CTAAAAACTGAATAAGCATCTCCGC	TTTGCCTCTGGGTCTTTCACTGAAACGCGGAGATGCTTATTCAGTTTTTAG
539	1130	TGTGTGTGTATGTGTGTGTTGG		CAAGAACACCTGCCCCGT	P	AGAGTTATTGAGAAXGCCAGACTTTTT	AGTTATTGAGAAAGCCAGACTTTTTAAAAAAAAATGCAAATTTCCAGGCCT

Row#	REF#	1 Upper PCR primer	Modified	2 Lower PCR primer	Modified	3 GBA primer	4 Flanking sequence
			-		-		
540	1131	ATTAAGATGCAGTGGGAAGAGCT		TTATTGTCTATCCTTCTCTCCATAAAATAAAG	P	TTTAGAGTXCCXGCTGTGTXCCAGGCA	TAGAGTGCCTGCTGTGTGCCAGGCAGTTTCTAGATGCAGTAGGTATACGTC
541	1132	AACATTGGTGCACTGGTACCC		ATGATCTTTCTAATGCTTTCCATGAA	P	AAAGACTTAGACAGCCACACAATAA	AAAGACTTAGACAGCCACACAATAACAGTGGGAAACTTTAACACTTCATGG
542	1133	GTAGGAGTCCTTTCATTTTATTCTTCTTTT		TGCCATTTCTCCCCCAAA	P	CAATTTCTACAAAAAAACCATCTTG	CAATTTCTACAAAAAAACCATCTTGGATTTTAATTTTGATTTCAATTAAAT
543	1134	GTTCATACTTAGCATAGTAGMTGATAGGTAAT		TGGAGGTAGGTCTCTATGACATGC	P	TTTAATAAATTGGTCTTCTACCCTT	TTTAATAAATTGGTCTTCTACCCTTGTTTCATTCCTCTGGCTTCTATGATG
544	1135	CCACTTCACACTTTTTGGTATTTTTT	P	AGTTGCTAGGTTTGGGATACTTTTAAA		AAATACAGCAATAGATACCAAATAT	TCACTCCACTGATGGTACCAAAACCGATATTTGGTATCTATTGCTGTATTT
545	1136	ATTTTTGCACTGGTTATTTCTCTCTG	P	CAYTGGGTAAATACAACCATTTCAA		AGAAATTGGXCATAACAAAGAGGCTAC	CTGGATTTCGGATTTGCATGGGCCCCGTAGCCTCTTTGTTATGGCCAATTT
546	1137	GATTGCTTGAGGCCAGGAG	P	ATAATAAACCACCCAGTATAACCACATATTTA		CATATTTAGTCCTXTTCATTAAAACAA	TTAGAAAAACCTATCTCATCAATTCGTTGTTTTAATGAAAAGGACTAAATA
547	1138	ATCTCCACACCACTCTCCTGATC		GAAAGATGTGACAGAAAATACTGATTAGG	P	GGAXTGCATGTACACAGTTTGATGGAC	ACTGCATGTACACAGTTTGATGGACGTCTGTGTGTGGCTGCCTCATACAGA
548	1139	GATTTGAGTGATGAGATATAAGTTATTTTAAGATG	P	TCATTAGTGCTTAAGTTTTGAAATTGTG		AAGCATATTGGATTGGXTACTTTAGCA	TTTCTAGGTAAGAAGAAGAAAAATTGTGCTAAAGTAGCCAATCCAATATGC
549	1140	CGGGGATCTGAAAAGCCA	P	TAAATGTGTGGTGAACCACGG		TTTTCAGTACAXAGACAGTCCTTTAAC	GCTTGAGTATCTGCCAAGTTTTTAACGTTAAAGGACTGTCTTTGTACTGAA
550	1141	TAATCGTTAGCAYCTTCCAGAATTC	P	CTCTACTACAGGGAGGCTCACAAG		ACAAGATAAATTGXCTCCCTTTGGCTG	TGTTTGTGTAATTGAAGAAAACAACACAGCCAAAGGGAGGCAATTTATCTT
551	1142	GACTCTGAGCTTGAAGAACCTCC		CTTCAATTACACAAACAGCAGCC	P	TGATAATXCAAGTXCTXATCGTTAGCA	ATAATGCAAGTGCTAATCGTTAGCACCTTCCAGAATTCTTGTAGTTCTCAT
552	1143	CCGTATGGAATTTCCTAAAAGTATAGAAA		TGCCGACATAATGCTGGG	P	CCTCATGATCTGCTAACTCCACTTC	CCTCATGATCTGCTAACTCCACTTCCCGAAATAAAATCAGTATTTTCCAGA
553	1144	CATTTTTTCTGTCTAATCTGCCCTTA		TAAAAGTGACCCAAATGAGAGTTCA	P	TACCCAGGTTATTTTTTATTTTAGT	TACCCAGGTTATTTTTTATTTTAGTGATTGTAGTTGTCATTGGTTGAACTC
554	1145	GCCAACATCTATTGGGTTTTTTTT	P	CCAGGGAAATGCAAATTAAAATG		CAGTGAGATACCACCACCTTATTTC	ACTTTTTAATAATGGCCATACTTGCAGAAATAAGGTGGTGGTATCTCACTG
555	1146	AAGCAGGGAAACTCCTTAGCTTT		CATTCTAAATAGCTACTTTCCAGGGG	P	AGAGGTCCATCTGACTGTTGATTTG	AGAGGTCCATCTGACTGTTGATTTGCGATATTTAGTCTTCCTATTACAGTT
556	1148	ATCTAAGGAGCTCTGTAAATGACTATCC	P	ACGTTGAAGTCAGTACGCAGG		AGGCTGGCATAGGCXTGATACCTGG	CAAGGTCCTATGTGTTAGTCCTTGCCCCAGGTATCATGCCTATGCCAGCCT
557	1149	AAAAATGTACTGAGCTTCTTGTCACATAT	P	GATGAGTCCAAGGTGGGCA		CAGXGTCAGATCXTACAGGTCCCCTTA	ATAGAAATCAGGTCCCTTTGCAGGCCTAAGGGACCTGTAGGATCTGACCC
558	1150	CAGAATATACATTCTTCTCATCTGCACA		ATAGTTTTGACTGTTCCTCTTTGTGTTC	P	TCAAGTACTTTCTCAGGTCACAGGA	TCAAGTACTTTCTCAGGTCACAGGAGAATAAAACTAGAAATGAACACAAAG
559	1151	AAATGGGCACAAGGATGG		CTTTCTCATGGATCTTGGACTTCT	P	AGGGCGTTXCACACAGGGCATTGTCTT	GGCGTTGCACACAGGGCATTGTCTTACCAGAGGCAAACACTCTGGGCTGTG
560	1152	GAATGAGTCAGGATATAGCAAGTCTATAATACA		TGGAATTTGTGAAAATGCTAACTTG	P	TAGCAATTCAAACAGAGGGAAAAAAA	TAGCAATTCAAACAGAGGGAAAAAAACTATAAATTGCAGAAAATCTACRTT
561	1153	TACCGGGGATCTGCTTAGC	P	GAGCTCCCACAATGAWCATGG		CTACACTGCACTGCTCTXTAAGAAACT	AAGCATTAAGTTTGATTGTTGTGCAGAGTTTCTTATAGAGCAGTGCAGTGT
562	1154	ATCCAGCTATAATCCTCATTGCAC		GACAACCAAGTATCTCAAAACCCA	P	CTGTGTTGXCCTTCAGCCTGTTAGACT	GTGTTGGCCTTCAGCCTGTTAGACTATTTTACGTAGGACTGAACCAACCCC
563	1155	ATAAGAAGGTGAAGCTGTAGGACCA		CAAATACAGGGAGATTTTCTAATGATTTT	P	CAAACAAGGGAGAGAAAGGGAGTCC	CAAACAAGGGAGAGAAAGGGAGTCCGAGGAATTGGGGACCTGGCCTAACAA
564	1156	TTATACTCTAATTCCTAAGCATCAGTAACACA		GGGGATCTGTTGAAGTTCCTCT	P	CTATGAAAGTTAACAGAAGGTAGAA	CTATGAAAGTTAACAGAAGGTAGAACTCAGCTGCCCCTGCTCACAAGCATC
565	1157	ACTGTTGTACCCAGGAAGCATG	P	TAATTATTGCCGTCATCACCCT		AACTATGTTXAAGGGCTXAAGATTCAC	TGCTGACAGAAAAGAAGTTTCAATACGTGAATCTTCAGCCCTTCAACATAG
566	1158	TGGGTTATAGTCAAATGGTAAGGC	P	GTATTTAGCAATTTCAAAAAGTAGACCCT		CTCCATCACTGGCTGTTGXAGTCTTCT	AAGCAAAATACCCCAATTCTGAAAGGAGAAGACTTCAACAGCCAGTGATGG
567	1159	TACACTGTGATCTGAGAAGATATTTGA		CGCTAATAGACATCTACAGAACATTCC	P	ATATTATTXCATTGTTTTGXATTTATT	ATTATTTCATTGTTTTGAATTTATTGAGACTTGCTTTATGGCCAAGTGTTT
568	1160	CACAAAGCATTAGTGACTTTAGTGACG	P	AGTCGTTAATGAGTGATTTTAAATAGCTTG		TAAATAGCTTGCTGTGTGCTTCCTA	TGAGGATTATTGCCCAGACTTCCTACTAGGAAGCACACAGCAAGCTATTTA
569	1161	CCTACAAAAGCAATGCCCTG		CCAGCCCCGCTAAACTGT	P	TCTCACACTCCTAATAAAGACATACC	TCTCACACTCCTAATAAAGACATACCCAAGATTGGGTAATTTATAAAGAAA
570	1162	CAAGATTAAAAGAGAAATCGTTGARAATAC	P	CTGCTGCCCTGTGAAGAAGT		CCATTATGATTGTAAGTTTCCTGAG	TCACAGTTCCACATGGCTGGGGAGGCCTCAGGAAACTTACAATCATAATGG
571	1163	GGATCTTGGGACGCTGTG		CCAGTAATGGAATTGTTGGCTT	P	GXAAGCTGTXTGGAARTTTCACAAAGA	AAGCTGTTTGGAARTTTCACAAAGAGTTTAAAATAGAATTACCTTTCAAGC
572	1164	CTGATTTCACTTATGCACATTTAAAGAA	P	TCCACAGTGCCATCCACC		TTTCCCCACCAAAAGACAACTAATA	AAGTATTAAAGTACACCAAATTTTAGTATTAGTTGTCTTTTGGTGGGGAAA
573	1165	CGGGGATCTGGTTAAATGG		CTCTGCTCCGGTCTCTGG	P	TGTCTCTGTTTGCTCCXTGAGATGCGA	TCTCTGTTTGCTCCATGAGATGCGAGCCCTGAGAGGCCAAAGCTATTTTTT
574	1166	TCACTGTCACGAGAATAGTATGGG		CTCGAAYTGTAATCCGCATGT	P	GAAACTGCCCCCATGAGCCAATCAC	GAAACTGCCCCCATGAGCCAATCACCTCCCACCAGGTCCCTCCCTYGGCAC
575	1167	CAATCACYTCCCACCAGGT		CTGATATGGTTTGGCTCTGTGTT	P	TCCCTCCCTYGGXACXTGCGGATTACA	CCTCCCTYGGCACATGCGGATTACAGTTCGAGGTGAGATTTGGGTGGGAAC
576	1168	TAATATCAAGAGGAGCTGCTGTCTTC		CGTCCCAACAAATCACCACT	P	ATTCACTCTGAAAACTTACCTTTGT	ATTCACTCTGAAAACTTACCTTTGTGGACTCTTTGCCAAAGGTCTGTTCAG
577	1169	CTGGGAACGGTGAGGTGA	P	AGAGGCCATAGTTTTCAAGTAAGTCTT		CTTCATTTTCTTTCATTTTCTGTGA	CTTATGTTTTGAATTCCCAAGGGCTATCACAGAAAATGAAAGAAAATGAAG
578	1170	GGTATCCAGCAGATATCATCATTATTA		AGAAATCCTTTTTTCCTCAGCC	P	ATTGTAGATGTTGTTATTXTAGCCCAG	TGTAGATGTTGTTATTATAGCCCAGACAAGGGGATCTAGTGGGAAAGTGGC
579	1172	ATAGCAAGTCACCTTTACTCCAGTTTC		GAAGATGTGGGAAGGTTCCAA	P	AGACCACCTCTGCCTTGACTTCATT	AGACCACCTCTGCCTTGACTTCATTGTCCATGTCACTATCAGCATTTTGGT
580	1173	ACCACTACGCCTGACTAATTTTTG		CACTTGGGAGGCCAAGGC	P	TATTTTTAGTAGAGATGGGXTTTCACC	TTTTTAGTAGAGATGGGGTTTCACCGTGTTGGCCAGGCTGGTCTWGATCCT
581	1174	ACACAGACCCCCCAGAGG		CTTGTCCAGACTCCCGGC	P	ACCTAAGGAGAACATXGGAGAGCCCAA	CTAAGGAGAACATGGGAGAGCCCAAAAGTCTCCTTGATTTGAGGAGACAGA
582	1175	TATGGTGACAGAGAGGTCAGCA	P	CAAGGCAATAATTGAGAATGCAA		AACCTTTCAATTAAATAGGAGAAGC	GGTGGGGGCAAGAACTCTTGAGATGCGCTTCTCCTATTTAATTGAAAGGTT
583	1176	GCAATGACATTCCTCACAGAAATAG	P	ATTCAGGTAGTGTAATGTTTCCAGTTTT		TTCCAGTTTTGTTCTTTTTGCTCAG	AAAGACCCCAAATAGCCAAAGCAACACTGAGCAAAAAGAACAAAACTGGAA
584	1177	CGGTACCANNGGGGATACTTTT	P	GCTGCCTAACGTGATGATAAGAGT		CAAAGAAGCTGAAAGAAAAAGGTAG	AGACCCCNCTATGGACATCCCATTTCCTACCTTTTTCTTTCAGCTTCTTTG
585	1178	AGGCCATTCCCCCACCTG		GTAGAAGGCTCACAGCTTTTGTG	P	TGTACAATGCCXGTCCCCCACCACAGC	TACAATGCCTGTCCCCCACCACAGCGGTAGTGCTGCAGTAGATTTTTGCTG
586	1179	CCAGGCAGAGACTTATTCTCATCTAG		TGGCTACACTATACAACAGATGTTCAA	P	CTAGATAACATCTTCTTCCAATAGA	CTAGATAACATCTTCTTCCAATAGAGGGCTGTGTTGTCTACATTGAACATC
587	1180	AAACAAACATCCAGAGCCCTG	P	GTCTGCCTCCTCTGCTGC		TGGGGTCTGCCTCCTCTGCTGCCTC	GCTGCTCCGGTCCCAAGGAGAGGCTAGAGGCAGCAGAGGAGGCAGAC
588	1181	AACTGTGAATAAATTGAGCCTCTTTATC		TGGTACCTGTAAACAAGAACCATACC	P	AGACTCTXGTRAATACAATACTCTTGT	ACTCTTGTRAATACAATACTCTTGTGAACACAACCAATATATTTCTGGTAT

Row#	REF#	1 Upper PCR primer	Modified	2 Lower PCR primer	Modified	3 GBA primer	4 Flanking sequence
589	1182	TTGAATTGTAGCTCCCATAATTTACAC	P	CTACCAAAAGAATAGCATGGGGA		GGAAAACTGCCCCACAXTTCAATTC	GGTTGTGGGAGGGACCCGGTGGGAGGGAATTGAATTGTGGGGCAGTTTTCC
590	1183	GCGTTAATACTGATTCATTTATTAGCTCTAG	P	AGAGATGATAGTATCTTGCAGGTAGAAAAC		TAGAAAACTCTAAACCCTAAACCCT	AGTTTTGTGYGTGAAGGGGGATCTGCAGGGTTTAGGGTTTAGAGTTTTCTA
591	1184	TGAGCCAAACTGCCTGAATG		TCGAAAAGGAGGGGGCCT	P	TATTGCCTGTCAGTTTTGTTTCAAC	TATTGCCTGTCAGTTTTGTTTCAACGGCTCTTCATGTTTCAGTTCTTTTGC
592	1185	TTTTTTCTTTCTCTTTTTGTAGGTATGG		GATCATTTCAGCCCAGGAGTC	P	TTTGCCGCXCAGGTGGGGTXCAGTAGC	TGCCGCCCAGGTGGGGTGCAGTAGCGTGATGATGGCTCACTGCAGCCTGGG
593	1186	AACAGTCTTTCCATATGTTTACCTCC	P	CATTTTGTCTTCTCACTGCACATC		TCCXTCXTTCTCAGGAAGCCAGTCATT	ACCTGTCATGTAGTTGAAGTACCAGAAATGACTGGCTTCCTGAGAAGGAAG
594	1187	CTGTTTGTGTGTCTGCTTTTATGC	P	AGCCAATGCAATTCTGAGCA		GAAXGAATATGTAGGCATCATACTACC	GATGTTTAATAGCTTGTAGTATATCGGGTAGTATGATGCCTACATATTCAT
595	1188	GCTCGGGGATAGTATGTGCA	P	ATTCAAATCTCTTGCCCATTTTTC		TTCTATTGAGCTGCCTTTTTCTTAC	AGTCTACAAAAGATATTTATAGATAGGTAAGAAAAAGGCAGCTCAATAGAA
596	1189	ATCTCAGCTCACTGCAACCTC		CATAATGAAACCCTGTCTCTACTAAAACTAC	P	GCCTCCCACGTTCAAGTGATTCTCC	GCCTCCCACGTTCAAGTGATTCTCCCGCCTCAGCCTCCCAAGTAGCTGGGA
597	1190	GAGCTGAAGAACCATCTCTGCTAG	P	ACCCAGGGGATCTAATCTTTTTT		AATATTTAXAGATATTTGATAACTTTC	GTATGGCATGTCAGCATACGAAAGTCGAAAGTTATCAAATATCTTTAAATA
598	1191	AACATAGGGAGACCCCCCC	P	CAGAGATCCTCCTGYCTCAGC		TACGACTGCAGSCATXTGCCATCACAC	CCAAAAATAAAAAAAAAAAATAGCTAGGTGTGATGGCACATGSCTGCAGTCC
599	1192	TGAGGCACTTTGGTATTTCTCAG	P	GAATTACTCAGTCTCGGGTATTTCTTC		CAGTGTGAGAATAGACTAATACAAG	CTCTTGTCCTGAGCACATAGTAGGTGCTTGTATTAGTCTATTCTCACACTG
600	1193	CCTGGCACCATTATACAAGCTACT		CTGTTGCTGTTGAGGAGGGTT	P	TGCAAGCTXTGTGTGCAGAACCCAAGG	CAAGCTCTGTGTGCAGAACCCAAGGCGCTCTTCTGGAGTGAACTCCACAAC
601	1194	CACCAATTACCACAATTCTTGCA		ACGATGCTATTGTTATTTCCCAAGTA	P	TTATTACCCTCGTTGTCTTCTCTCTCT	TTATTACCCTCGTTGTCTTCTCTCTGTATATCAATTCTTCAATTCTTCAAG
602	1196	CCAGACAAAATTATTACCTGTTTCCA		TCACCAGGATTTTCAACTGAGAA	P	CTGTGTCTCCTGAGTGTGTCACCTC	CTGTGTCTCCTGAGTGTGTCACCTCGTTAGGTTCAATTATTCTTAAATTTC
603	1197	CACTTCACCTATAAAGACACATATAGACTTAAAG	P	ACCTAATATAAGTATAACAACTTCTGCTCACTCT		CAACTTCTGCTCACTCTXGTTTCCATT	GAAGGGATGTGAAAAGACTCCACACAAATGGAAACCAGAGTGAGCAGAAGT
604	1198	TGTGGAGTGGTAGCAATGCTC		GTGAGGGTGAAAAGGTAGCACA	P	AAGTXACCATTTGTAAGAGAGTAAGAA	GTTACCATTTGTAAGAGAGTAAGAACGGATTATTTGGTCCTGTCTTCTCTG
605	1199	GGCATAGAAACAGACACATCGAC		TTCTTGGCACCTTTGTCAAAA	P	CCAGAGAGAAAGCCCAGAAATAAAT	CCAGAGAGAAAGCCCAGAAATAAATATAGTCATTTGTGGGCAATTGATTTT
606	1200	AATATCCTGTGTTCATGGATTGGA	P	ACTGTTAGGGCCTTTTGTAGTTCC		TTGAATTTTGGTTAGGGATTGTATT	TACTACTTCAAGTGATCGACAGGTTGAATACAATCCCTAACCAAAATTCAA
607	1201	TGCAAACATTCCTTCTATGGCT	P	GAACATTCCCTTAAGCCAAAGC		AAGCCTAATCCAGAGCAAGACCCTA	TCACCTCTCTCAGCCTTCAAGAGAGGTAGGGTCTTGCTCTGGATTAGGCTT
608	1202	CCTTACACTTTTATGTTATGAAAACAACTTG		TGAAGGCTGAGAGAGGTGAGTAAG	P	CCTTAAATCTCATGAACCTACCTCT	CCTTAAATCTCATGAACCTACCTCTGCTAGTTGCAAACATTCCTTCTATGG
609	1203	ATTAGGTCACGTCACATGGCA	P	GAATCTTTCTTGAGCTCCTAATCCC		CCGACCTCTACTCCCAGAXXTAAAGGA	AGCTTAGCCAATGGGCATGCCATAAGTCCTTTAAATCTGGGAGTAGAGGTC
610	1204	CCATTGAGTAAATAATGCGATTGTC	P	AGTCTCAGATATGTCTTTATAACAGTGTGG		TAACAGTGTGGAGAATGGACTAATA	TATGTCATAGTGGCCCTTGAAGATTGTATTAGTCCATTCTCCACACTGTTA
611	1205	GCAACCTACGCAAGAGATAGGA		TCCACACCTCTTCATGCTAGAAA	P	GGTAAAGAGAGAAACAAAACTATTT	GGTAAAGAGAGAAACAAAACTATTTATAACTCTTATCAATAACATTTTTCT
612	1206	TCTGTCTATGGAGCAGCCATTT		CTGAAGAGAGGGAAGGCATG	P	TCTTTCACTCTTGGCTTGCTCTTGA	TCTTTCACTCTTGGCTTGCTCTTGAGTTGTTTCCTGAGTGAAGCCAAGAAC
613	1207	AAGCTGAGCCCCATGCCT	P	CTCCTTCCTTCTACAATCCCTTAA		TGCTGAGTGGGGAATGAGGTAGGAG	TGAGATGGTGCAGCTATCTGCTTCACCTCCTACCTCATTCCCCACTCAGCA
614	1208	GTATACATAATAACATTCTCTATCACCCAA	P	TGTGTGTCGGGGTTGTTG		GGTTGGGGTTGTTTGTTTTGTCAGG	GGTAAYGGAGGGAGTCACCTTTCCAACCTGACAAAACAAACAACCCCAACC
615	1209	GGCTAATTGTTCAGAGATTTATTTAACTAGC		GGGTTGGGGTTGTTTGTTTT	P	ATAACATTCTCTATCAXCCAAAGGTAA	AACATTCTCTATCACCCAAAGGTAACGGAGGGAGTCACCTTTCCAMCCTGA
616	1210	TCCCTCCACTCCTCCAACC		CTAACCCCTCTGTTCGATCTTTATAATAC	P	TCATGAGAAAGATAAGCACTCCCAC	TCATGAGAAAGATAAGCACTCCCACCACCAAGACCTGGAGGTGGGAAATGA
617	1211	TCCACTGTTGATGGGCACC		TGCATGTTCATCGTGGCA	P	GGCTGACTCCATGTCTTTGCTATTG	GGCTGACTCCATGTCTTTGCTATTGGTCCATGTCTTTGCTATTGTGAATAG
618	1212	ATTGGTAGGAGGAGGACTGGAG		GATCTGAGATGGATCTTTCTTTGC	P	CCTTGAATATCCGGAAATCTATGGC	CCTTGAATATCCGGAAATCTATGGCCGTGGGATGCAGCTGGAGAGAACTGT
619	1213	GGTMAGGGTAGATGAGAAGKAGTCTC		AGNCGCTTTGCTTTTTGTT	P	AGAAGAACAGAAATTCATAAAATAA	AGAAGAACAGAAATTCATAAAATAAGCTATAACAATCAGGTTAAACAACAA
620	1214	GGAATAAATATTATCTCATTTGATAGAGTGATTG	P	GAGTCCTCCCCAGCCATG		WTTTTCTTTTGTAAGTTGTCCAGTC	TTAACACTGCTGATAAAGACATACCCGACTGGACAACTTACAAAAGAAAAW
621	1215	ATGGGTAGCAGAATCAGACTTCTTT	P	GTCCTGTTATCCTTTTCAGAGTCTTAGAT		TAGATAAGGXGCTTTGCTCAGCCTGTG	GCACACTTTCCCGTTGCCTCAGCGCGCACAGGCTGAGCAAAGCTCCTTATC
622	1216	CAGGACTGGGTTTTATGTCTCC	P	ACCGGGGATCTTTTTAGTCTATG		GATXTAATTAAAGATAGAATGGTTGTA	TTAACTATTAGATAATTAATATTCTGTACAACCATTCTATCTTTAATTAGA
623	1217	ACACCATCAGCATCAGCAAGA	P	CCCAAATATCTGTTGGATGAATAAAG		AATTTAGAGGAGAAAGACATAGGTG	CCTCCTTGAGATCCTTTTGTTCCTCCCACCTATGTCTTTCTCCTCTAAATT
624	1218	ACTGTTGGGAAGGCATAATTGG		CTCCCACAATATGTGATAATTCAGG	P	GTTTTGAXATGTGAGGACXTGAGATTT	TTTGAAATGTGAGGACATGAGATTTGGGAGGGGCCAGGGGCTGAATGATAT
625	1219	AGAACAGACTAATACAGTCAACTGGTACC	P	CCTCTGCCTGTTTCCCAGTT		AGTTCCXAAGTCACTTCCXTGTTTTTG	GAGTGGGGCRTTGCTGAAAAGATACGCAAAAACATGGAAGTGACTTTGGAA
626	1220	GAGTTATTCAACATTACCATGAAATGC	P	TGGTTCCTACAAATGAAGACCAAT		GCTTATCTGTTCGTGGTAGAAGTGT	TTTTTTAACAATCCTACCAATTTACCACACTTCTACCACGAACAGATAAGC
627	1221	GTTAAAGTGACATGTTCAGGGTCAC	P	GGTCCAGCGGAAGAAGGTT		GAAGGGAXAAXCAGAAGTAAGATTCTA	TACCTAATTTGTTGCAAAGGTAGAACTAGAATCTTACTTCTGATTCTCCCT
628	1222	CAGGGGATGACATGGCAA	P	CTATTATAACAGAATACCACAAACTGGCTAA		CTCACAGTTCTGGAGGCTGGGATGT	TTTGGTCCCTTGATCCTCAATCTTAGACATCCCAGCCTCCAGAACTGTGAG
629	1223	TCAAGCGATCCTCACACCTC		CACTTGAACTCAGGAGTTTGAGAC	P	TAATTTTTGTATTTTTTATAGAAAC	TAATTTTTGTATTTTTTATAGAAACGAGGTTTCGCCATGTTGCCCAGTCTG
630	1224	GGCCTCAGTGAAGGTCTCCT		CCACTCAAGCCCTTGTGC	P	TGCAAXGCTTCTGGATACACCWTCACC	CAAGGCTTCTGGATACACCWTCACGCTACTGTATGCACTRCCAGGTCCAT
631	1225	AAATAAGGATTCCAGCAATCAA	P	GAAATTGGAGTATGATTGAGAAATGC		GTGGTTGGGATTAAGGAAAGGAGGA	CCATAAACCCAGAATCTAATTATGAGTCCTCCTTTCCTTAATCCCAACCAC
632	1226	TATCATGAGGCAGAACTGTGAGAT	P	CAGGGTTTCACCTTCCCCT		CCTTGGCTAGTTTGTCATTGAGATG	ATGATGGGTTCCTGGCTCAGCTTTGCCATCTCAATGACAAACTAGCCAAGG
633	1227	AAAACTCCACATGATGTTTGCAG	P	GTTTTCTTTCCTTGGAATGGTGA		TCTGGAAAAGAAAGTAAGCACTGGT	CCTGGTAGTTTCAGACTCCAACTGGGACCAGTGCTTACTTTCTTTTCCAGA
634	1228	TATCTTCAGAAGGAGTTGGCTGG		CCGGCAGCTCTGTGAACA	P	GTCTGTGAGAGCCAATGAACCCTTT	GTCTGTGAGAGCCAATGAACCCTTTGGAAGTTCTCAGATGGCCAATGAGGA
635	1229	ATCCTCCCAAACACCTTTGC		AAATTTGCTTTGATATCCCAAAGTG	P	ATCAGTAGGCTCTTGTGAAGGAAAG	ATCAGTAGGCTCTTGTGAAGGAAAGATGGATGGCACTTCCCAGATATACCA
636	1230	GCTTTCCCAAGAGTTGGAATTG		TGGTATCGAATAATGAATTGTATTCAG	P	ATTTGTATACTCATGCTGXACTACCTA	TTGTATACTCATGCTGTACTACCTAGTACAATGGCCTGTTGAGCTGAATAC
637	1231	AGGAAGCTGAAGCACGAGAAT		TTTTCTTTTTTTTAAGACAGGGTCTC	P	CTTCAXCCAGAGAGGCAGAGGTTGTAG	TCAACCAGAGAGGCAGAGGTTGTAGCGAGCTGAGATCACACCACTGCACTC

Row#	REF#	1 Upper PCR primer	Modified	2 Lower PCR primer	Modified	3 GBA primer	4 Flanking sequence
			-		-		
638	1232	TTTAAAAAGTGGCTTTCACCTCAT		CTTTGGCAGAGAAATGTTAGGAAG	P	TGTGAAGGCATGGGGAGAAATGTGA	TGTGAAGGCATGGGGAGAAATGTGAGTTATAAATAGCCAGGAGAAACTATG
639	1233	TTGGACAGCAAAGGAAAA	P	GAGCTCTGAGAACTACAGACTTGACTT		ACTTGACTTGCAAACACAGATTAGA	TAAAAAGATGTTCTTTGCCCTCCTGCTCTAATCTGTGTTTGCAAGTCAAGT
640	1234	AGGGCTACTGCTGCTCCAG	P	CCTGGCCCCATGACAGCT		CCATGAACACCTGCACGACAGACAC	ACATGCCTGTTGGAGTGGTGGCTCCGGTGTCTGTCGTGCAGGTGTTCATGG
641	1235	AGTATTGAGAAGAAGGCTGGCAT		CATCCTTTGAACTGGCAAGG	P	CTGGAATAGGAAXGTTTTTACTTACAA	GGAATAGGAAAGTTTTTACTTACAAAACAACAGCCAAGTCAGTCTGGCATC
642	1236	AGTATTCTTAGTAAGGGCTCGCA		AGCTGGCAGGAAGCGGGC	P	GTCCCCGAATATGGCATTAGTACCC	GTCCCCGAATATGGCATTAGTACCCGATACCCGGCTGAGCTCAGACTTCCA
643	1237	CACCCCACCCACTTCCTT		ACTGAATTTATTATAGCCTTCATATTTCCTG	P	GTGTGTAACAATTATTTGAAAGATT	GTGTGTAACAATTATTTGAAAGATTGAGTGTAACATTTCAGGAAATATGAA
644	1238	GCCATGTTTCACACTTTCTGTAATT		ATATCCACCATGAGGACCACAG	P	GGAATGTTXATTTGTCTTGTATTAGTG	AATGTTAATTTGTCTTGTATTAGTGGAGGCTGCAATCAGTGATATTACTGT
645	1239	ACTGACACGTACCGCATTATAGTC		CAATATGGAACCCGAACCAC	P	GCATGTTTACAAAACCCCCAGGCGA	GCATGTTTACAAAACCCCCAGGCGACACATGTGCACATTAAAGCTGAGACA
646	1240	AACATGGTGAAACCCCGTC		CTCTGCCTCCTGAGTTCAAGC	P	AAAATACAAAAATTATCCAGGCGTG	AAAATACAAAAATTATCCAGGCGTGGTGTGGGTGCCCCGTAATCTCAGCTAC
647	1241	GAGCATCTGCCCCAAACC	P	TGTAGAACCATTTTGGTGTCTTGG		CAATTXGTTCTTATACCAGXGCTATGT	AAATATCGCTTTCTAGAAGAGAAGACACATAGCTCTGGTATAAGAACCAAT
648	1242	CTCCCCATCCTCTAGTTCTCTATTTT	P	ACTACATTCTTATGCAAGTTGTAAAGGC		TTGTAAAGGCTAAATCTCATAAAAT	CTTGGTGTTATGGCCTATATTAAAAGATTTTATGAGATTTAGCCTTTACAA
649	1243	TTTTGTGATAAGTTAGAATTAGGTAAGAGAACA		CAATGGTCTTCATTCAGGTGCT	P	TTAAGCAAGATXCCAGGCAGAAGGAAC	AAGCAAGATTCCAGGCAGAAGGAACGTGGCAAGAGGGAGCAATAAAGGCCA
650	1244	CCTAACACCACCACTGAGAGC	P	CAAATACAATGATAGGAGCAAATGTCT		GTAAAAAGCACTCTAAGAACCCAGA	TCACCAATTCCTCACCCGGCTCCGCATCTGGGTTCTTAGAGTGCTTTTTAC
651	1246	CCCGCTCCAACCTCAGAG		CATTATTTTTTGTTTGCCAAGACC	P	GCAAATTCCCCGACATCAGAGAAGC	GCAAATTCCCCGACATCAGAGAAGCAGCCCTGGGCCACTAAACGGAAACCT
652	1247	CAAACTCCTTTTAATAAACTCTCTGCC	P	ACTCAGCAACTTTTTGTCTCCATC		CTATTTACTCAAACAGGAAGAAAAC	ATACATTGAAAAAATAAATGCTCTCCGTTTTCTTCCTGTTTGAGTAAATAG
653	1248	GTACCTTACACTTGGCTGTATTCCC	P	GTGGAAGGCATTTACATCTTTGG		TCAGTATCTTCCCXAACXTGGTTCCCA	ACTTTCTGAACCTGAACAGGAAACTGTGGGAACCATGTTGGGGAAGATACT
654	1251	CTGTTCTCTAGCCTGGGTGACA	P	TTCATAGTTGTTTCTGATAGCATTTCAG		ACATATAAAXTTAAAAGATGAAATT	AATCTCTCAATTAAAAATGGATCCTGAATTTCATCTTTTAATTTTATATGT
655	1252	CTTATTTGTTCCCAATTCCGG		GACATCTAATTAAATTGATCATCTACAGTGAT	P	AGTAAATTACAAGTATGAGCTAAGTTT	TAAATTACAAGTATGAGCTAAGTTTACTTTGCCAGTAGTGTTTGGCAAACA
656	1253	GGCTGAACTTAAACCATTTTACTCAG	P	AGGCAATCAGCACTCAAGAGG		GTGGTTTGGTTTAAAACXAGGAAAAAA	TACAGTGCAACTCATAAGCAAATGAGTTTTTTCCTAGTTTTAAACCAAACC
657	1254	TGCCTAATGTACTACACATGATCGG	P	ACCTGGCACTCATGTCTCCC		AAGGACTGTGACCTTTGTGAAAAAT	CGAAAAACTATTACAAATAAGTAACGATTTTTCACAAAGGTCACAGTCCTT
658	1255	TCCCAAATCATGACATTTTCTTG	P	ACATTTCTCTCAGATGTCCTTTTAGGTA		CCTTTTAGGTATATACTXTGTTCACAT	ACATTTTAATGAAAACATGATTAAAAATGTGAACACAGTATATACCTAAAA
659	1256	TGGGCTGTACCCATTTTATTTG		TCTCGCTTCTCATAGAGCACG	P	GGCAATCATTTAATTCXTGTTCATAGA	CAATCATTTAATTCATGTTCATAGAGGGAATATTTTAAGAACGTATAGGGA
660	1257	TGACGGAAACTTCCATAGAAGAAA		GCCTGGGACCACTGCATAT	P	AGGGCTTTAAGAGCAGTGGTTGTTA	AGGGCTTTAAGAGCAGTGGTTGTTAAGTTTTCATTTATGTAGGAGACAAAA
661	1258	ACCACTTCTCTCTGTACTTTTTCTTCATT		CATGCAGGATGAATATACAGAGTACCT	P	AAATGAGAGGCXGXGACCAGGCAACCCCGTGCATCTGGTGGCTGGTGACTCAG	ATGAGAGGCTGGGACCAGGCAACCCCGTGCATCTGGTGGCTGGTGACTCAG
662	1259	TTGTCAGGGTATTTTCCGTAGAGA		GTTTCTCGGCTAACACCCTC	P	CTCCAAATTACCTATGTGTGATCTA	CTCCAAATTACCTATGTGTGATCTAGTTATAAAGATTTGCAGGGAGCAGCT
663	1260	TTTAGTCCAAGGGAGTCCTGC	P	GAACAATGCAACGCCCTG		CAAACATGAATCTGGGXACGGAAAGTA	TGACTACCGCCTTATTAGAGAGTCAGTACTTTCCGTACCCAGATTCATGTT
664	1261	AGAGATTTGATGTGGGACAGAC		ACCAAGAAGCCAAAATATGAAATAAAC	P	ATTTTATCCCATTTCATTTTGACAC	ATTTTATCCCATTTCATTTTGACACCGGCTTTATTTCAGTTTTGGAGCAAA
665	1262	CTAACGAAATAATACCTTGATCACTTGAA	P	TGAAAGTTATATTTGGAATCAATGAGG		AATGAGGTGATATGGTTTTATGCTT	CACATATACCTCATATACATACACACAAGCATAAAACCATATCACCTCATT
666	1263	AAGAAAAGTTTCCTATGGGAAGGAC		CTGAGATTTGAGGCTACTGTAAATCC	P	ATGAGTATTAGTGGTCTTTCTGTCT	ATGAGTATTAGTGGTCTTTCTGTCTCCCTCAGGGCCACAAAATTCCCCTGG
667	1264	CATTCAAGATTTTTTCTGAAGTTATTTCC	P	TTTTAAAGGAACAGTTTGAAAACACTG		ACTGTTGTTGTACAATCTGTGAAGG	ACCATAGTTGTGGGCTCTGAAATATCCCTTCACAGATTGTACAACAACAGT
668	1265	CTTGAGTCCTCCTCCATATCCA		TTTGTTTTAGAACATTTCGCCTC	P	AATAACACATTTACATACACCGAAT	AATAACACATTTACATACACCGAATGTATCTTCTGTTAGAAAGGTGGAGGC
669	1266	ATCATCATTAGTCAAGCTATTCAGAGG	P	CATAAAAGCATTTGCTCCCTG		GGTCACCAGGGAAACCAGGCGAGGA	CTCCCACCCATCTTCCAGGTCCCTCATCCTGGCCTGGTTTCCCTGGTGACC
670	1267	GGGGAGACTTCTATTTTATGGAAGAA		AGCTATCTTATGGTAGAATAGCCACTTTAA	P	CATCCTCAGTGATTGGAAGATTATC	CATCCTCAGTGATTGGAAGATTATCACAATGGAAAGGCCTTTTAAAGTGGC
671	1268	TTGCATTTTCTGATCCTTCATCC		GAGAGAGGGGTGCCATTTACA	P	AATGTTCTTCCCTCAGTCACCCAGA	AATGTTCTTCCCTCAGTCACCCAGAGGATGTTTTCCTGAACATCATTCAGG
672	1269	ATGAAGTCTTATGAGAATTGCCTCTTATT	P	CAATCCCCCATTCATCTCAG		GTCAGGGTGAGTTGAGTTTGGGTAG	CCCCAGTGCTGAGATACACAAACTTGCTACCCAAACTCAACTCACCCTGAC
673	1270	CCAAAAAGCAATTAGGCATATAAATAAC	P	AGTGAGTCACCTGTAGACAGCGTAT		TTGTTTAXATCCATTCTCCAAATTGGT	TGTATTACACTCTTCAAATGAAAGACACAAATTGGCAGAATGGATTTAAAC
674	1271	TCTGAAGTCGAAGTACTCGCC		CTAAAGTCCAGCTTCTCATGCTG	P	GAGGTCCGTGCGCTGTGGTAGCAGG	GAGGTCCGTGCGCTGTGGTAGCAGGGGGGAGCCCCGCCAGCCAAATGCCAG
675	1272	GTTTAGCAAACTTTGACAGGCAA	P	TGAGCAACTCAAAAAGAGAAAAACA		AAAAAAAAAAAGAAAAAAACCCTGA	GTGAACTGATCTTATAGGAGAGATTGTCAGGGTTTTTTTCTTTTTTTTTTT
676	1273	ATGCAGAAATCCTCAGCAAAATATTA	P	CCTTGCATCCCAGGAACA		CAAAGCCXACTTAATTGTGTTGGATTA	TCAAATCCAGCAGCACGTCAAAAAGCTAATCCAACACAATTAAGTGGGCTT
677	1274	CCAGTGATTCCACAGTACAAAAGAG		ACAGAAATGCAATATTCGTTACAAATG	P	TCTTCTTGTAATATAACATTTCTGA	TCTTCTTGTAATATAACATTTCTGACTTTAAAGAGATAAAGTATCAACATT
678	1275	GAATTAGTCTCTGAGGGCATGAACTA	P	TGCATAACTATTGTATGCCAGGC		GGCACTGGATCAAGGAATACAAAGT	TTTTATTCATCTTTATATCTTTATACACTTTGTATTCCTTGATCCAGTGCC
679	1276	CAGGAGGTCAATGCCGGG	P	CAAACTTCTCCATCGCCCTT		AGAGATCCAACCACTCAATCCTAAG	CTGCATCCCACCTTGCTGATGAGGAGCTTAGGATTGAGTGGTTGGATCTCT
680	1277	ACATAGGGTATCTTATGTCCCAGGA		TTGACACAAAAACATCTGAACTAAGAAC	P	CTTTGGAATGXACAGGTACAGGATCTGC	TTGGAATGTACAGGTACAGGATCTGGGAATCTTAAGTTTTGGTTGTTCTTA
681	1278	TCTTTTACTGTGTGCACTGGTGA		CTCAAAAAACAAGACAAAAATGCAC	P	ACTGGCTGCTAGGAGAAAGTGTGGT	ACTGGCTGCTAGGAGAAAGTGTGGTCCCATAAGCAAATATGTGCTTTACAT
682	1279	GAGAAGTTTTCTAATATCCTTTAAGTTGCTATC		TTCATTTCCTCTCCAGAACCC	P	ATTCTGATAAATGGATTGAACTATG	ATTCTGATAAATGGATTGAACTATGCTTCTATAATAAAATAATTATATGGG
683	1280	AGTTTGGGAAGAACAAAAGCTCA	P	AATTCAAGTTGAGATTTGGGTGG		GGGTXGGGACACAGCCAAACCATATCA	TGAATTGTTGTTTTGCACTTACTCCGTGATATGGTTTGGCTGTGTCCCCAC
684	1281	ACCCTGAAAATCACCCAAATC		CCTGCCAAGACATACACCATC	P	ATAGTTTCAAXTAGAGCAATAGTAATA	AGTTTCAATTAGAGCAATAGTAATACTGATCATGTATCAAAGAAAAATGCC
685	1282	ACACCTGAGTAGACCTCAGAGCC		GTTCAGTGAACATTAGAGGGCAG	P	AACXACXAGATGCATTTGGCAGTGTAG	CCACCAGATGCATTTGGCAGTGTAGGGGCCAAGGGAAAGCATTCTTTCTGC
686	1283	ACTCCAAGTATTCCTTTGCAGATTC		CAAAGTGAAATATCCTCACAAAAAAAGTA	P	GAGCGGAATGCACACATCACAAACA	GAGCGGAATGCACACATCACAAACAGGTTTCTCAGAATGCTTGTCTACTTT

Row#	REF#	1 Upper PCR primer	Modified	2 Lower PCR primer	Modified	3 GBA primer	4 Flanking sequence
687	1284	CACAATCAGGTCTGATTTTACCAAA	P	TGCATTACACTAGTATGAGAGAAATACAGAA		AGAATGTCTGTTTTGXAXTTCCATG	AACTTAGAAATACTTCTAACTTAGGGCATGGAATTTCAAAACAGACATTCT
688	1285	TATGTGACTTGCCTGTATCTCACAG	P	CATTTCTCTGTAAATTTCACTCTCCTC		AATGCTCAGCCXTTTAGGAXTAGATAT	CAAACCTGAGGTTCTTAACTACTATCATATCTAGTCCTAAAGGGCTGAGCA
689	1286	TGTATATGGTGAGAGAAGGAGTCTAGTCT	P	ATGCATTGGAAAATAAGGTAGTCTCTT		TAGTCTCTTAAAAAAAAAAAAAAAG	CATGCAAATATTAAATTTTCCCAGTACTTTTTTTTTTTTTTTAAGAGACTA
690	1287	CACTTCCTGTGACACCCCC	P	GTCATGAAGGTGGGTGGG		GGTGTGAGCCCCCTTGCTGGAGAGT	AAACCTCGGCCCTCCTATCTTAATACACTCTCCAGCAAGGGGGCTCACACC
691	1288	ATGAATGAATGAGCAGTAGGCAG		CAGAATACCCCAGAGACTCAGACC	P	GCCTGTGACXAGGTGGTTGGGGACGAG	CTGTGACCAGGTGGTTGGGGACGAGCCCCCCTCAGATCAGCCCCAGGTCTG
692	1290	CCGCTCCTATTGCTCTCTAAAAA	P	GGGATGATTTAAAAGAGATAGATAAGTATATGC		AGTATATGCAGCAGTGTATAGACGC	TTTCTATGGGCATGCAATATTAGATGGCGTCTATACACTGCTGCATATACT
693	1291	AATGGAGCCCACTATCACAAA	P	CATCAGAAACCCAGAAACCTG		CTCTCXCXCGTGAGAGGTCTGTGTGGG	AAGGTCAGGAGGGCCTTTCCCTGGGGCCCACACAGACCTCTCACGGGGGAG
694	1292	AAATCTCATTTTGAATTATAGCTCCCA	P	CATCGAGATCTTGTGAGATGTATTCA		CTCATGATTCAGTTACCTCTCACCA	AATCCCCATATGTCATGGGATAAAGCTGGTGAGAGGTAACTGAATCATGAG
695	1293	AAATCTCAGGTTCCCTCCCA	P	CTAAATGCGGAAGACAGCAGAG		AGAGAGCAAGGCTGGGCGGCACACG	CTGAGTCCTGCACATCTCACTCCAGGCGTGTGCCGCCCAGCCTTGCTCTCT
696	1294	AGCTTATCCAATGACTATCTCTGAAAATAA		GGGGCATATGTTATGAGGATTCT	P	CACTAACCCTCTTATCTAXATGTGCCC	CTAACCCTCTTATCTATATGTGCCCGGCACTTGCCACACAGACATGGCGAG
697	1295	ACAAGAATTATTCTGTCACATGATATGG		TAATAATAATGTGTAATGTTTATCCTGACTCATC	P	GAGAGCACGAAAGAACCACATGCCCC	GAGAGCACGAAAGAACCACATGCCCGGGCCCTCAGCATTAGATGAGTCAGG
698	1296	AATCAAAAAGAAAGGAGGAGAAAGAA		CTTAAAATTTCTATGCCCTCTTGTCTC	P	TCAGGAGAAGTTTTTCAGGGTGTTA	TCAGGAGAAGTTTTTCAGGGTGTTAGAGGAAAGGGTGGGAGAACCATAGGG
699	1297	ACTTTGTTTTCTGCCAACTGCA	P	GAAGCTGATGATTGAAAAACTCCTC		AACACGTGAACCCACCTGACTTACT	GAAGACAAAACAGATGAGGAACACACAGTAAGTCAGGTGGGTTCACGTGTT
700	1298	TATCATATATAATATCAACCGAAACAGACAG	P	GATAGAGGTCCCTGACTCCAGAC		ACCACAGTTAATGGGGGAGATAGAC	AGCCAGCAGTCTAATTGCTCATATGCGTCTATCTCCCCCATTAACTGTGGT
701	1299	GGGAGAGAGGGAGGAAGACT		AGCGTCTGTTTAAATAGCCTCGA	P	GCCAGGAAGAACAGAGGGAGGAAGA	GCCAGGAAGAACAGAGGGAGGAAGACCTGCCAGCAAGAACAGGGAGTCGAG
702	1300	TATCTACTCAGAAACCACGCACAA	P	CTTGCAGGGACAGTGGCTT		CTCTCGAGTCCATGTCCCGCCGCAG	GGAGCACTGGGTCTTTGGAGTCCGGGCTGCGGCGGGACATGGACTCGAGAG
703	1301	TGTTCCAAGACATAAAGATCAGGAG	P	GATGACAGAGGTGGTCATGGC		TTCTAGATGGCTGTCAGGTGGTGGG	AGAAAAATTCAATGTAACTAAAGCTGCCCACCACCTGACAGCCATCTAGAA
704	1302	TTGGTGTAGAAGAGAAGCAAGAGAG		CATATCTCTACAGAAAACCCACATTG	P	TTGGGTGGCCCAGGCACTAXCTGTCCTGT	GGGTGGCCCAGGCACTAGCTGTCCTGTCAAGGGGCAGAGCTCTCTGCAATG
705	1303	AAGATCATTCTTCCACGCCTAAC		GAATACGGTGGTCTCTGGAGTC	P	AATTGCAGTAACTCGCCTTTGGGAG	AATTGCAGTAACTCGCCTTTGGGAGGGAGAAAGGAAAAGGTAGGCAATTTA
706	1304	AGATGACCCCTGATGGTTAGCT	P	CAAGGAATTTCCAATGCTGTTG		AAAAAATAGTTAATCTGTTCAGTTC	AGCCCTCATTGAGTGCATCCTGACACGAACTGAACAGATTAACTATTTTTT
707	1305	GCTTTTGTTGTTTATTGTTTAAGACATCA	P	AGGTGAATCGATCTGTGTGGTG		AAAATCAGTAACAAAAATAACATCA	TTCATTGAAGCTGTCTCACAGCTACCTGATGTTATTTTTGTTACTGATTTT
708	1306	TGTAGCTGGGACTACAGGCAT		GTAATTCCAGCACTTTAGGAGTCC	P	GATGCCCAGCTAATTTCTCTTTTTT	GATGCCCAGCTAATTTCTCTTTTTTAAAAAAAAAATTGAGATCGGGTCTTG
709	1307	TGGCCTAGCCTCTTCCTCTG	P	AATTTAACAGCGTGAAAGAACAGATT		AGAAXAGXTTCGATGCAGGCTATCTGT	CCCTTCTTCCAGGAGCCAGCATGCCGACAGATAGCCTGCATCGAATCTGTT
710	1308	AGGTGGCTCTATCTCAGAGAGGA	P	TCTGCTTGACTCTGAAAATCACATT		ATCACATTCTTXGCTACTATGCTATAA	GACTATAAAGGGTAGATAAATATTACTTATAGCATAGTAGCTAAGAATGTG
711	1309	GGGGTGACAGTATGTATGTAACCAT		ACGGTTTAGTTTCAATCTTAGAACAGTT	P	CTATGCCCATTCACAGATXCAGTAGAG	ATGCCCATTCACAGATGCAGTAGAGAGAAGAATTTCTTAAAGACAACTGTT
712	1310	TCCTTCCCCAAGAGCAGC	P	CAAGGTCACAAAGTGAGGAGC		AGCXAGCAGCGGAXACTTGTCTATGTG	GAATTCCCGAGGCTATGCTGGGATTCCACATAGACAAGTCTCCGCTGCTTG
713	1311	GCACAGCCAAGTCTGAAAGTTT		TGTAGTTCTGAAGTGTGGGACTTTAAA	P	CAACAAATTGGTXCAAAGATGAAATAT	ACAAATTGGTTCAAAGATGAAATATGTATCAATATATCTAAGAACCCTTTA
714	1312	AAATCTCCAGACCAAGAAGAAGC		AGAAAGAAAGAAAGAAAAAGAAATTGAGG	P	TATAGACCTGATGGAGAGCACTACG	TATAGACCTGATGGAGAGCACTACGCGGTTCACTTGAAGACCCTCAATTTC
715	1313	GTCAGACAATATGCAGCAGTGTAAC		AGGAATGAGTGTACCATTCTTTATTCAC	P	TGTAATTAATATCTCAAAAAGGATG	TGTAATTAATATCTCAAAAAGGATGGGTGGGGGAATTATAGGTGAATAAAG
716	1314	GCACAATCTCCCCTCATTG	P	GGCACCTGTAATCCCACCTAC		TACTCGGGAGGCAGAGGCAGGAGAA	AACCTTTGCCTCCAGAGTTCAAGTAGTTCTCCTGCCTCTGCCTCCCGAGTA
717	1315	AAATTACTCAACATCACTGACTTTTAAGATAC	P	CATGTTAGCCAGGATGGTCTC		GATCTCCTGACCTCGTGXTCCACCCAC	TAATCCCACCCCTTTGGGAGGCCGGGGTGGGTGGATCACGAGGTCAGGAGA
718	1316	TGAGCAGGGGGGATGGGT	P	AGGGACAGCACTGGACTTCC		TTCCATCTGXAGAGCCCCCTCCCCTCA	CCCACCTAGCAAGCAGGTGCTGAGAGTGAGGGGAGGGGGCTCTCCAGATGG
719	1317	TCCAGGGTCTGGGTCTGC	P	CATCGCTAACCAGGCCCA		CTTXTGCTCACCCAGCCACXCTCAGAG	TTTCTGCTTTGGCCCACCCTCCAGGGTCTGGGTCTGCAGCTCTGA
720	1318	TTGAGGCCAGGAGTTTGTGA		CAAGTAGCTAGGACTACAGATGTGTGC	P	TAGCGXGACCCTTATCTCTACAAAAAA	GCGAGACCCTTATCTCTACAAAAAACTTAAAAATTAGCCGGGCATGGTTGC
721	1319	TTGAGAGGGCAAAGCATAAT	P	CATGATTCAAGGGGGAAAGG		AGGAACCTGCAGCAGTCTXTAATAAAC	AGTTTGTGGCCAGAGGACAAGCTGTGGTTTATTAAAGACTGCTGCAGGTTC
722	1320	TTTTGTGACCAGGTTAAACAAAAAGTA	P	ATTACAGGCGTGAGCCACAA		CACCTGGCCTCCATTGTTCATTTAT	ACCAAAAGCGTGATTCCTAAAAGTCGATAAATGAACAATGGAGGCCAGGTG
723	1321	CTGCGCCTTCCTCTGCTC		CCTCCACCTGCTGAATACTAGTAGC	P	CTTCAACCATTTCACTTCTTTCGTG	CTTCAACCATTTCACTTCTTTCGTGGCCACCACTTGGCTGGGATGCTACTA
724	1322	TGTTATTCAGATAAAAGACTGAGTTATGCA	P	CAAGGAGTTTATGATCCCATAACTGA		GAATGAATGAATTTGCCGATGTCAG	GTGGGGGAGAGTGCAAGCATGAAAGACTGACATCGGCAAATTCATTCATTC
725	1323	ATGGACAGCTATGACATGATTACG	P	GTAGTCCCACCTATTCAAGAGATCAA		GTACAATTTCAGGTTCTCTCTATCG	CCTGCAGGCATGCAAGCTTGTTATTACGATAGAGAGAACCTGAAATTGTAC
726	1324	TTCAACATCCTCCAGGACAGC		CATATCGAGCCCCTGTCCC	P	ACAGTATCTGGTCCAAATGTCAACA	ACAGTATCTGGTCCAAATGTCAACAGCGCCAAGAGGGACACACCCTGCCCT
727	1325	AATCTTCCTGCCTCAGCCTC	P	GAAGGTCAAGATTGGAGGTTTG		AGTGAGACTCTGTCCCTAAAAAAAA	CACTACACCTGGCTAAGTTAAAAAAATTTTTTTTAGGGACAGAGTCTCACT
728	1326	AGATTTTGTTCTACCTATTCCTAAGATCTGT		CTGTGAGGATTAAATAAGTGAATGCA	P	ATTTTTTTTCCTGCGTGCCAGATAC	ATTTTTTTTCCTGCGTGCCAGATACGGAAATAAAGACTTTCTGTGCATTCA
729	1327	TATAAAAGGCTTATTTCAGTTAGAGAGTGTTC	P	CAGTCTCGGGGGCTGATC		GGTAAGGGAATGATCTACAGGGTCT	CGACCAGAATCCCATGACCAAGGGACAGACCCTGTAGATCATTCCCTTACC
730	1328	AACTCCCCTCCTGCTCAAAC	P	CTGGGCTCCCATCTTCAAG		AGAAGATCCTTAACAXTXATTCTGT	CCTGCAGGCATGCAAGCTTGGTGGAAACAGAATTATTGTTAAGGATCTTCT
731	1331	ATGCTACTAATTCTTGGTCAAAACCC	P	CTTTTATAAGTTATGGCTGAAGACAAAGG		TGTAATCCTAAATAAAACTXCGGTCTC	GTCGACCTGCAGGCATGCAAGCTTTAGAGACCGGAGTTTTATTTAGGATTA
732	1332	ATCATCGCAGGGGTGGGG	P	CCTTACCTCTCTCACAATAGAATATCGTAC		AGAATATCGTACGXCGTGXGCTGGCAA	TAGAGTCGACCTGCAGGCTTGCAAGGTTGCCAGCGCACGGCGTACGATATT
733	1333	ATGACAGTTTGACATGATTACGAATTC	P	CTCCACAATGCTGGTTCCTAG		GGCAGGATTTGAACCCTAACTCTGA	AGAGTCGACCTGCAGGCATGCAAGCCTCAGAGTTAGGGTTCAAATCCTGCC
734	1334	CCTAAGCCACCTTTGGCAT		ATAAGCCGTCTCCTCCATTTACC	P	TATACATTCTATTCTTAGTCATTTT	TATACATTCTATTCTTAGTCATTTTCTCCTTGTTCACCTGAGTTTCCTTCT
735	1335	TGATGGGAGCTCTGTGTGG		CTTCCGTCATGAACTTTGGC	P	GGCXCXCAGTGAGCTTGATAAGGGAGG	CCCCCAGTGAGCTTGATAAGGGAGGAGAGGCTGAGAGCTGGTTCCAGCCCG

Row#	REF#	1 Upper PCR primer	Modified	2 Lower PCR primer	Modified	3 GBA primer	4 Flanking sequence
736	1337	TTCTTGCTGGGGAACCTCA	P	GAAAGAAAGAAAGAAAATGAATTTTGG		TTTGGCATAAAAACTTGGGTCTCAT	TGTAAAAAGCATATTGGTGGGAAAGAATGAGACCCAAGTTTTTATGCCAAA
737	1338	TGAGGTCGGTGCTGGACG		CGCCACCACCCCAGGAAC	P	CGAGTACACGCGXCCAGTACACAGGGC	AGTACACGCGCCCAGTACACAGGGCGTGAGCTCATTACACGCCCCAGTTCT
738	1339	TGTAAAATGATTATGATTACCACACTCAA	P	GATCTCAAGTGTCCTACACATGCA		ACACACACACACACACACACACGGT	TAACACATTAATTACCTTACCTAGTGACCGTGTGTGTGTGTGTGTGTGT
739	1340	TGTAAAATGATTATGATTACCACACTCAA	P	GATCTCAAGTGTCCTACACATGCA		CACACACACACACACACACACGG	AACACATTAATTACCTTACCTAGTTACCGTGTGTGTGTGTGTGTGTG
740	1341	TGTAAAATGATTATGATTACCACACTCAA	P	GATCTCAAGTGTCCTACACATGCA		ACACACACACACACACACACACG	ACACATTAATTACCTTACCTAGTTAGCGTGTGTGTGTGTGTGTGTGT
741	1342	CATGCCCAGCCTCAACAT	P	AGATGGAAGTAATGAAATTTGTGTATGTC		ATTTGTGTATGTCAGTGATXACGGTAA	AATGCGAGACTTAAATCTACTCATGGTTACCGTAATCACTGACATACACAA
742	1343	ATCCACGCCCTACAAAGGG		CATAGAGAAGGCAGAACCGAGA	P	CTTTCCTGTTTCATAAGTAGCAATC	CTTTCCTGTTTCATAAGTAGCAATCCCTGTGGTAACAGCCCCTGTGGTGAT
743	1344	AACTCCTCTATCACACACCGATGT	P	CAAAATATGGAAAAAGCTCTCAATTG		GCATTGTCGACTGGTGTTGATTTAC	TTTCGGCATGACACAAAGCATGAGCAGTAAATCAACACCAGTCGACAATGC
744	1345	ATGTAAAATGAATGGCAAGGCA	P	CATTGCTGTACCTGGAAAATGG		GGGCCCACAGTAGCATTCTXCACTACA	TCTTCATCCCGACGGCAACATACGTGTGTAGTGCAGAATGCTACTGTGGGC
745	1346	TCATGGCAAAAGGCAAAGG		TTGTTTAAAAGTGTGTAGCACCTTCC	P	GGGAGTGAGGAGGXGTGAACACGGCAG	GAGTGAGGAGGTGTGAACACGGCAGGAACAGGAGCAAGGTGCAGGAAGGTG
746	1347	CTTAAATGAGTATAGCTGATGAATCAATGA		CCAAAATTGTCACAAGTCTTTGATT	P	GACAACTTTGGGCAGTGGGTCTCAA	GACAACTTTGGGCAGTGGGTCTCAAAGAATTCAGCTTCCTAGGCCTTCAGA
747	1348	TTCTGTGCCTATTGGGGTGA	P	CAAACTGTCTTTTTCTCATTCCTTTG		TTCCTTTGTCTCCTCTGGACTTCGT	CAACCAACACCAGGTCGTGGGGCGGCGACGAAGTCCAGAGGAGACAAAGGAA
748	1349	GTTTTTCAATATAGTTTGTTACCTATTCACAC		TTTCAAGATGACAACAGAGACATTAAATAT	P	CAATTATTTTTCCTTTTTCAAGTGA	CAATTATTTTTCCTTTTTCAAGTGACACATTCAGCATAACCTGAAAGATTA
749	1350	TATCCATGATACTTGTTTGTGCTCTC		GTACACCAGAGAAACAAATGCATG	P	AGTAGGTCTCCTGTCATCTCAGCAC	AGTAGGTCTCCTGTCATCTCAGCACGAGGTACCAGTGCCTTTGGTTCATGC
750	1351	ATATTTTCCAGGGAGTAATCTTTATATTTGG		CATCTAAATCTGGAGCTACCCAGA	P	TTACTCTCAAGGGATAGTXCAGCATGT	ACTCTCAAGGGATAGTGCAGCATGTGCTTTTAAAATGCCCTTCAGGACTTG
751	1353	TTTTGAGATGGATTTTTCCTCTTG	P	CAGGAGAATCACTTGAACCTGC		ACCTGCGAGATGGCGGTTGXTGTGAGC	GGCTGGAGTGCAATGGCAAAATCTCGGCTCACAGCAACCGCCATCTGCAG
752	1354	TGTTTGTTCCCCCTCTGGTAG	P	CTATTTCCATCTTCCTATCCCCAG		GCTACGTGGTAGCCTXGAAAATCAACA	TTTTATGACTACAGTAATTGCAGGGATGTTGATTTTCAAGGCTACCACGTA
753	1355	GGGATAGGAAGATGGAAATAGAGC	P	GATTCCTCCATGAAAACAATCAGA		TTATCACAACTCTGAAGGCTAACCA	AACACTTCTCAGTTTATTGAAAGCCCTGGTTAGCCTTCAGAGTTGTGATAA
754	1356	CCCTCTACCAATTTCTATATAAGTCAGGA		TGAGTATAATACCAGAAGTATGACTGTTGATC	P	TCATAACAAAAACCCAAATCTCAGA	TCATAACAAAAACCCAAATCTCAGAGAAAAATACAACAAAAACTTATTTTA
755	1357	CCAAAGTCGAGTATGTTGCCA		TCCAATCTGGTTGGTAAATAGCC	P	ACAAATAAAAAATGAGGCAXATAGGCA	AAATAAAAAATGAGGCATATAGGCAGCTCTAGACAAGGTCTGGAATGGCTA
756	1360	CATCTTAAGTGGTACATTTAAGTATTAGCTCC		AGCTAAGTAAGTGACACATCAAAAATATCA	P	CTCAATGAAATATGTAATGTTTTAT	CTCAATGAAATATGTAATGTTTTATAATTGTTCAATTTTTAAAAAAATTTC
757	1362	AACATCTTACAGCAGATACTCCTTACACA	P	AGCAGGGAAACTTCCTGTCAG		CCTCCTACAXTTAGAATTGGGGGAATT	AGGCAATCCTCTTGTTATTTTCGAGAAATTCCCCCAATTCTAATTGTAGGA
758	1363	GTCTTTCTGCTTCAGCCTTCAG		GATATTAACAATATCTTTAATGRCATGCCT	P	ATTXCATATCTAATCAGTGTAACAACA	TACATATCTAATCAGTGTAACAACAACAGCTACTTAAAGAAGGCATGYCAT
759	1364	TGAGCGGTGGGGCTGGAG		GTTTCACCCATTCCAAAAGTCC	P	TCAGAACAAGGGATGGAGGTCTCAG	TCAGAACAAGGGATGGAGGTCTCAGAGTTATCTGGCTGGATATGAGAGTTG
760	1365	GCCCTGAAGACTAACACACAGC		TGAGGTCTCARATCTGCCATC	P	AAGTTAACCTCAATGCTCXTGTGAGAT	GTTAACCTCAATGCTCATGTGAGATCAGTGCTATTTCCACTTTAAAAGGAA
761	1367	CAACACAGCATCAGCAGTTCA	P	TCGAAGTTCCCTTTGCTTGTC		CAATAATGTGCATTGTGTTGAGTTT	AACAAAGGTAATATGTCTTAATATAAAAACTCAACACAATGCACATTATTG
762	1368	GATGTACTGCTGAATACAGTTCGC		TGTCACTCAAAATTCCCAGGA	P	AGTATTTGGTTGAGGATTTTTTTAT	AGTATTTGGTTGAGGATTTTTTTATCTGTCTTCATCAGAGATATTGACCTG
763	1369	GCTATGACCCATGCCCCG		TTTACCAATGTATATGTTTATGTGTGTTATGC	P	CACACATAGATATATXCACAAGTATAT	CACATAGATATATGCACAAGTATATGTATATATGTGTGCATAACACACATA
764	1370	AGAGGGGAATATACTGTCTCTCAGTAAGT	P	TAGAATTGATTTTTGTGTACGATGTAATGTA		GAGTCGTTTCTTTTTTTMCCCCCCT	ATACTGGGACATCTGGATATGCATACAGGGGGGKAAAAAAAGAAACGACTC
765	1371	AGAGGGGAATATACTGTCTCTCAGTAAGT	P	TAGAATTGATTTTTGTGTACGATGTAATGTA		TAATGTAGGAGTCGTTTCTTTTTTT	ACATCTGGATATGCATAYAGGGGGGGAAAAAAAGAAACGACTCCTACATTA
766	1372	TGCCAGTCCTAAAATTCCCA		GTGACCAGGGTTGTTGGC	P	AATTAGTTCATTTTTAXAGTTTCTATA	TTAGTTCATTTTTATAGTTTCTATAGAAATAATTTTTTCCTATAAAAAACAA
767	1373	CATGCCACTGTACTCCAGCC	P	ACAGGACATACAGAATTACTTTCAAATGA		AGTATGTATGTAGGTATGTATGTAT	CAAGACTCTGTCTCATAAATACATAAATACATACATACCTACATACATACT
768	1374	GAAAAAGATGGCAAGTACACACAAT	P	GGTCTAATTTCATTTTCTCTGCATGT		CATGTGAATXTTCATTTTCCTAACACT	GTGAATGGACAGCCTCTTCAATAAACAGTGTTAGGAAAATGAACATTCACA
769	1376	CTCTTGGCATCATTATGGGC		AACCTCTAAAACATGCTACAGGTAAACTATTA	P	AAAAGAATGGAAAATCAATCAGAGG	AAAAGAATGGAAAATCAATCAGAGGGCCTGGGCATTATAATAGTTTACCTG
770	1377	ACATGTCTCTATCTCAGCGTTCCT		CTTTAGGAAGGTCACAATTCAGGC	P	TCCCAACACTCATCAAGCCCATTAT	TCCCAACACTCATCAAGCCCATTATATTTTCCCATGTGGCCACAATCTGTT
771	1378	AACTTTTCTGTCTAGCTAAAGGATTGTAAAC		GATTGGTCCATTTACAAACCCTTAG	P	TTGTAAACACACCAATCAGCACTCT	TTGTAAACACACCAATCAGCACTCTGTAAAAACGCACCAATCAGTGCTCTG
772	1379	CTCAGTGGAATTGTGTCAACAGG	P	AATTTTTTTTGGAAAAAAGGTCTCTG		GGTCTCTGCTTTTTCTATTTTGGAT	GACTGAAAAAAATTMTCAGAAACAGGATCCAAAATAGAAAAAGCAGAGACC
773	1380	CTCACACCTGTAATCTTGGCA	P	CTTGATATGTTGCCCAGGCT		CTGGTCTCAAACTCCTGGGCTCAAG	TTGGGGCGGCTGAGGCAGGAGGATTGCTTGAGCCCAGGAGTTTGAGACCAG
774	1382	CATTGAATGTCTACCATATGCCTG		TCATTTCATGTGTGTAAATCATGTTATG	P	AGAAGACCTATGCCCTTTACTCAAA	AGAAGACCTATGCCCTTTACTCAAAGAACTTATCTTATTGGCATAACATGA
775	1383	TTGTCTGCAAAGACTGTGAGAGAT	P	TGGCCTTCCTCAGAGATGTG		GCCAATTTACTTTCTTCTTTTGAAT	ATACACACAACAGAAAAATATGACCCATTCAAAAGAAGAAAGTAAATTGGC
776	1384	AATGGCTTGATCAGAGTTCACTG		AAAAATAAAAAAATTAGCTGGACATGG	P	CTCCCGGGCTGAAGTGCTCCTCTCA	CTCCCGGGCTGAAGTGCTCCTCTCACGTCACCCTCCTGAGTAGCTGGGACT
777	1385	AAGCCATTAAAGCTGAGAAGAGTTAGT		AATTTGACCGATAAAAAGACACTCAG	P	ATTGGTTAAGTTCACGCACCTAGAG	ATTGGTTAAGTTCACGCACCTAGAGCGATGGAGCCAGGAAGCTGTCCTGAGT
778	1386	AATAACATTAGGAGTGTTGGCAGC	P	CATTTCTCCCAAGAGCAGGAA		TGGGAGCAGAGCAACCTTGTGACGA	CCTGCTCAGAGGGAGGAAGGTGGGACTCGTCACAAGGTTGCTCTGCTCCCA
779	1387	AGGCGGAGGTTGCAGTAAG	P	CTTAATCAGATTGCCTGGTGC		GGGTAGGGCCCGGAXACAGTATTTTTT	CTCAAACAAAATAAAAATAAAATTTGAAAAAATACTGTATCCGGGCCCTAC
780	1388	CTCATAGAGAAATAGAACACACTCAGCT	P	GGAATCCTAGAACATCACTACATAATTTCT		TATXTTTAAATTACAAAAXCTACTCCC	CTTACCTCTGAGGAGGGGAGCAGAACGGGAGTAGCTTTTGTAATTTAAAAA
781	1389	TTTTTAGCTCCAGATGACATTAAAAACT	P	GTTAGCCAGGATGGTCTCGAT		TCGXTCTCCTGACCTCGTGXTCCGTCC	ATCCCGGCACTTTGGGAGGCCGAGGCGGACGGATCACGAGGTCAGGAGATC
782	1390	CCACTGAATTGTACACTCATAAATGG		ATTTTTTATCTTGTGTTTATACATGTGTGTG	P	AXAATGGXAATTTGGTTTTATATTTGC	AATGGCAATTTGGTTTTATATTTGCGTATATATTTATACAGCTTTTTGTTT
783	1391	ACTCGCAAAAATATAGGTACACATCG		GGTACCTGTGTCGAAAATCAGTTG	P	TGTAACAGAATAGAAAGCCCAGAAA	TGTAACAGAATAGAAAGCCCAGAAACGGGCCTATGCATGTACAGTCAACTG
784	1392	CAAGAAAACACATTTCCTTATTCACG	P	GTGGAAGGTGTATCTTAAATTGGTCA		AATTGGTCAAATAAGACXAGATGGAAG	TGCTCTCCCAACCATAAAATATAAGGCTTCCATCTAGTCTTATTTGACCAA

Row#	REF#	1 Upper PCR primer	Modified	2 Lower PCR primer	Modified	3 GBA primer	4 Flanking sequence
785	1393	CTAGCAGGCCCAAGAACCTC		GCATTGATTACATAGGAATACCAGATTT	P	CAAGXCTGTAAGTACAATCTAAAGTCA	AGACTGTAAGTACAATCTAAAGTCAGTCTTGGTTTGGCTTCCTGTCTCAAG
786	1396	TCCTCCATGCCCGACCAC		CATGAGGGGACTTAGTCTCTGAG	P	TCXCATGTCTTCXGGACCTGAGTTTGG	TCATGTCTTCAGGACCTGAGTTTGGGTTGTGGTGGCCATCCGGACCCCCTC
787	1397	CAGGTCCTCTGAAACCTGGAT	P	AAATGTGACTAAGTCATTACAAATGTGACT		GTGAXTGAGTCATTACAGTGGACCCTC	AAAACGGATTCTTTTCAATGCACCCGGAGGGTCCACTGTAATGACTCAGTC
788	1398	AAATTTGAATCCAGCCATACCTG		CTTTTTCTACCTTATGCCCCTCA	P	ATTXACTTTAXCTGTGGTGAATCTGTA	TCACTTTACCTGTGGTGAATCTGTACAGGTCTGCAGCTACCTCAGTTCTTG
789	1399	TACTAGTCTCAGAAGTATTTGTGTTTCAAGAA		TGTTGGCCCATACCTGCTAA	P	TGAATTGTATTTGGGATTATGGAAA	TGAATTGTATTTGGGATTATGGAAAGYAATGTTTTAATAAGTAAGACATAT
790	1400	TTTCCATGTGTGTGCCTGAG		GATTTCTTTCTACACAAGGTCACCTG	P	ACCCATCCCCATTGGCTCTTCTACA	ACCCATCCCCATTGGCTCTTCTACAGGTGATGTGTCTACTGTACACCTACA
791	1401	CTGAAGATTTATATTGATATTTGATGGAAAG	P	TGGGCTACAGATCAAGAGCTAGG		GGAAGAAAATATACCTTTAGAGTTA	ATTCTGGATGCATACAGGTTATATGGTAACTCTAAAGGTATATTTTCTTCC
792	1402	AATATATGTGTGTGTATGCAGTTTAAATTACC		ACTGAATGGCCTCCTGTGG	P	GCCAAGAACAAGGTGGTTXCAGTTAAG	CAAGAACAAGGTGGTTGCAGTTAAGGTGGTTAAAGCAGGTCTGTGGTGATC
793	1403	GTTTTATAGGATTTGGGTAGATAAAGG	P	CTTCTCCTGGCCCATCCT		TGTGACCCCCACTCCTGCCCACCAG	AAATTACAGTCAAAGGGGTTTGTTCCCTGGTGGGCAGGAGTGGGGGTCACA
794	1404	TAGGCTCCTGCACTTAGACTCCT	P	CAGTGTCAGATGAGCAGCAGG		TGGATGTTGTGCAGAGTGGAGAATG	TCATGCTGCATCAGCTCTTGGCCCCACATTCTCCACTCTGCACAACATCCA
795	1405	ACCGGGAGGTGAAGGCCG		CAGKCTGGGGAAGCTGGG	P	AGCCCCGCTCCCGTCCTTTGATTCT	AGCCCCGCTCCCGTCCTTTGATTCTGTCCCAGCACACGGCACCGGCAGAGC
796	1406	TTTGATTCTKTCCCAGCACAC	P	GGCCTGCCATTCTTCTGTG		GTGCCGTCGGGCXTCGGGAGGATGACAG	ACCGGCAGAGCCCCAGCTTCCCCAGACTGTCATCCTCCCGAGGCCGACGGC
797	1407	GCTTGGCCCAGGAGTTCT		TTTGACAGCAAAGACACTTCATTC	P	AACCTAACCCATTATTTTGTTGGTC	AACCTAACCCATTATTTTGTTGGTCGAAACAACAGCTACATCATTGAATGA
798	1408	ATGTAGCTGGTCAGTTCATGGTTTA		GTTTGTGTGTCTGTACACACTCTTCTG	P	TGAGTCATGGAACTCTGGGAGGGTC	TGAGTCATGGAACTCTGGGAGGGTCGAATAAAAGCAAAAATTTCTCTCCTC
799	1409	AGAGATTTGGTGAGGGTTAACATGT		CATGATCTTCCCATCTCAGCC	P	CATTTAAACXAGAGGCAGTGGCTCACG	TTTAAACCAGAGGCAGTGGCTCACGACCGTAATCCTAGCTACTTGGGAGGC
800	1410	AGTGTTTGTGTCCCTGGGTACTT		GAAACATGTGCTGTGTCCACTC	P	AGGGAGTGGTGATGACTCTXAACGAGC	GGAGTGGTGATGACTCTTAACGAGCATGCTGCCTTCAAGCATCTGTTTAAC
801	1411	TAACCTCAATAATAACCATCACTTTAGG	P	CATTTTTGGGCACCATCC		TGGTGCCAAGCCXTCCAGGTGATTCTG	CAATGTTTAAAAACTTGAGCATGCACCAGAATCACCTGGAGGGCTTGGCAC
802	1412	CTTTGGTGCTTCCAGCTCAG		ACAAGCAAAAGAGAAAAAAAGCC	P	CTGGTTTTCCATGACCTGAGAGACT	CTGGTTTTCCATGACCTGAGAGACTGTGACCAAAGTTAACTTTTTATCTCT
803	1413	CAGTTATACCTTTTAAATCCTACTGGGC		GCACTTGCCCCCAAATTT	P	GAATXCACTGTTTCTGGAACATCAAAA	ATCCACTGTTTCTGGAACATCAAAAGAGCAATGGCCTAATTAAGATAAATA
804	1414	CATATGCTAAGTGATCAATCGAAGTTAA	P	AACTCTGGTCTTGGGACATGTTAA		TGTTAATTAACATCTCTAAGCCTCA	TAATACCATTTTACAAATGATAAAACTGAGGCTTAGAGATGTTAATTAACA
805	1415	AACAACGCTGCGCTGACA		TTTGAAACTTCACTCGTTCCAGTT	P	ACATCAGGAGGGGCCACGGTGAACA	ACATCAGGAGGGGCCACGGTGAACACAGGAAATGGCTTTGGCAAATACTTG
806	1416	AAGTAGTAGGTGAGGTACTAATTATGGCAG		AAGAGAAGCAATGACCCCTCA	P	AACTCTTAAACTATTCAGTATCTCA	AACTCTTAAACTATTCAGTATCTCAGTAACCACACTATAGTATATACTGTA
807	1417	CCATATCTGCAAGTTCTGAAGATCA	P	TCACTTCTTAGTTTCTTTTCCACGC		CGCTTATTTTCATTCATYTTGATAT	GAACACACAGAATGTTTGTTGAATTCATATCAARATGAATGAAAATAAGCG
808	1418	GCTGACTTTGAGGTAGGCAAAG	P	TCCTCTGCTTATTCCTTTCTCTTGT		ATTGTATTAXAAAATTCTTATAGTGAC	AAAAATGATCTGATACAGCTGAAAACGTCACTATAAGAATTTTATAATACA
809	1419	AATGCAGATTGTGGTCCTTATTACC	P	ACTTTCCAGACTTGAAATTAGGTGACTA		AGTCACATAAACATTCATCTTCAAA	AATAACAATTACGATATTTATTAAAGTTTGAAGATGAATGTTTATGTGACT
810	1420	AGAAATCTAACTACAAGAGAAATTTGGTGA		CCATCTCTTCCAGAGACCACC	P	CCTCAGGAGATGTAGAATGGTCACA	CCTCAGGAGATGTAGAATGGTCACAGGCTGCATTTGTATGAGAGTCTGGGT
811	1421	CACCACAGAATGAATTTAGGTGAATAT		TGGGGTTTATATTAGAATAGGTTTTAGGTT	P	CTGTTGTCCCAGGGCAGTAAAAAAG	CTGTTGTCCCAGGGCAGTAAAAAAGGATACAGGCTACTGAACCTAAAACCT
812	1422	TTTAGGAGGACTCCAGTATTACCTGAT	P	TGACAGGGTAGAGAGCCAACA		ACAAGTAGGACTTTTCATTTATTTA	GAGAAATCTGCAGAGAYTCTTAACCCTAAATAAATGAAAAGTCCTACTTGT
813	1423	TCAGAACAAACAGTTTAACAAAACCA		CACCCTGGGCTCAGGACC	P	AGGGGGTTGTGGAGGCAGGGGGCTG	AGGGGGTTGTGGAGGCAGGGGGCTGGGCAGCCTGGAGTGTAAGTGCCAGGG
814	1424	ATCTCTACAAAAAAGACAAATATTAGCTGG	P	GCTCACGGCAGATTTGACC		ACCTCCCGAATTCAAGTGXTCCTCCCC	TCCCAGCTACTAGGGTGGCTGTGGTGGGGGAGGATCACTTGAATTCGGGAG
815	1425	TACTTATTTATTTCTATCCCAAGCTGTGA	P	CAGTCTATTTTCCCGCCTTTTC		CTTCCTTTGCCCCTCCCAACTTCCA	GCGGCGATCTGCGACTGCGCRCAGGGTGGAAGTTGGGAGGGCCAAAGGAAG
816	1426	TCAAACTGCATTTTGGTTCACA	P	CAGAACATTGCCAACAACTGG		AGGAAATGGCGAAATAAAATAAAAT	GTCATCCTTCCTTCTCTTTTTCAAAGATTTTATTTTATTTCGCCATTTCCT
817	1427	CTAAACATAGTTTGGTTCCTTTGTAAGTT	P	TGTACAGATGTTTATCACAGCATTATGTC		ACAGCATTATGTCXAAGTGGTTTTAGA	TCCAGGTAATGGATGAATGGATTGCCTCTAAAACCACTTAGACATAATGCT
818	1428	TAGCACAGCATCAGTACAGCACTAA		TCAAAATTAATGCAAAAGTGAACCA	P	TTACCTCAGATATTGTTATTTTGCT	TTACCTCAGATATTGTTATTTTGCTCACATTATTTTGAACGTTATGGTTCA
819	1429	GCAGTAGTGGTTATGTAGCTTTTAATACTATTC	P	TCTTTGTGCCATTTCTTTTTTACC		ATATGCCTTTCTTTTTAGGGACTTA	TTGCCCMTGGCTCRTTTTAAGATAAGTAAGTCCCTAAAAAGAAAGGCATAT
820	1430	TTTCCTCTCTTTAATGTGATTTCAGC	P	ATAACTCTCTCAGAAAATAACAGAAAATGTGA		GTGAACXGTCAGTTAATACAACAGCCA	TTTCCCAATCTCTTGCTTATGGCTACTGGCTGTTGTATTAACTGACAGTTC
821	1431	ACGAAGATCTCAAAATACTTCAAAACG	P	CTTCAGGTGATGCTCCCG		TTGGCCTCXCACAGTGCTGGGATTACA	GTCGGCTAGGCACGGTGGCTCATGCCTGTAATCCCAGCACTGTGGGAGGCC
822	1433	AAAGCGAGAGGAGGAGTGG	P	GCAAGAATTGAGGTTGCTGC		GCTGCTAGTAACCCAGATAACCGTA	CTTCTTAGAGAGAGGTTGGGGTGCAGTACGGTTATCTGGGTTACTAGCAGC
823	1434	ATCTTCTGAGCCCGGAAGTTT		CCTTAGTTTCCTTAGCTGTCTTTTTATTTTA	P	CXACTXCATTTCAACCTGGGCAACAGA	ACTGCATTTCAACCTGGGCAACAGAGTGAGACCCTGTCTCAAAAAAAATAA
824	1435	TCAACACACTCTATCCCAGCAC	P	CAAAAATGTTTTCCCCACATAAAC		GAGGGTCAGCAGGTTGGATAATGAG	ACTTCCACGGTGTCACAATTAAACAACTCATTATCCAACCTGCTGACCCTC
825	1436	TACTAAAAATACAAAAGTTAGCCGGG	P	CTCCGCCTCCCAGGTTCA		AGCGATTCTCCTGCCTCXGCTTCCT	GCAGKTGCCTGTAATCCCAGCTACTCAGGAAGCTGAGGCAGGAGAATCGCT
826	1437	GCCTTTATGCCAAATGTCTTAGACTA		AGACCTCAAAAGCAAAATAATCAGG	P	TTCCAAAAGAAAATAGAGGAGTTAT	TTCCAAAAGAAAATAGAGGAGTTATGGAGACCAATATTTAATAGAATAATG
827	1438	TGTACAAGACAAGGATGCCCA	P	GGATACTCTTTATTTCTTTCTCTTGACTGG		ATACTATXTTGAATAAGAGTAGTGAAA	TTCCTCTAAGATCTTGTACAAGACAAGGATGCCCACTTTCACTACTC
828	1439	AAAATACTGAGCTGAGAGAGCTGTTC	P	CAAAAAAGGTGCAGATTTTTACCTACT		AGACCCAGGGTCAGGTGAAGTTCTT	TTGACATCATAGTCCACAGTTTATGAAAGAACTTCACCTGACCCTGGGTCT
829	1440	CATGAGTGGATGCAGGGC		CATGCAGGGTGTGAAATCCT	P	GAATAAGGAGCAGTGGAATAAAAAA	GAATAAGGAGCAGTGGAATAAAAAAGCAAATGAGCGAGAGTTTATCAACAT
830	1441	AGAAAAGCTGTGATTTTAAAGTTTCCA	P	CTCGGAGGCTGTCAAGATTATG		ATGTTACACAGTCCCCACAAGTGCT	GGTGAAGCCTAGATACAGAGGTCCACAGCACTTGTGGGGACTGTGTAACAT
831	1442	TAATCAAACAAAATAATCTGGCAGG		GGCCCCTCTAACACACCTCT	P	CCCACAGGTGAATCATACAGAGTTT	CCCACAGGTGAATCATACAGAGTTTAAAAAATGTTGGTATGTTTAAACCAG
832	1443	ATTATTAAAATCCCCCACGGAAG		CATTAACAAGACACACAGGGTGG	P	CCCAGXGTTGCCTATCTCCTGACTCCA	CAGAGTTGCCTATCTCCTGACTCCACTGCACTCCCATTTGCCTTCTTTCCC
833	1445	CTTTGGCATAGAGTAGGAGTCAAATATT	P	TTAATGGTACACAAATAAGAAGTCAACAGT		GAAGTCAACAGTACCAAAACCCATA	CTTAGAGTAATGCTATTTCACAAACATATGGGTTTTGGTACTGTTGACTTC

Row#	REF#	1 Upper PCR primer	Modified	2 Lower PCR primer	Modified	3 GBA primer	4 Flanking sequence
			-		-		
834	1446	GACAGACTCATCAGATTTAGGAAACC	P	TGAGGCGAGGCTTGGTAA		GCTAGTGACTGTTTTTTTTTGTTTG	ACAGGCAAAAAAAAAAAAAAACCAAACAAACAAAAAAAAAACAGTCACTAGC
835	1447	AAATAATAAAGCCAGGATCATGAGAA	P	TCAAGAGAATCACGATTAGCCTTTAT		CTATTGCTTGTATATCTCATTTCAT	ACATTAGGAAAAAACAAGTGAATGGGATGAAATGAGATATACAAGCAATAG
836	1448	TTCAAAGCCCTCTTCCAGTTC		CAAAGAATCAAGAATCAGTGTGGA	P	GGATGAAATGAGTGTCAGAGCAGGG	GGATGAAATGAGTGTCAGAGCAGGGAATGGAAAGGAGAGTAGAAACTTTAT
837	1449	ATATTTGAAAGAATAAGCAGTATATGTCATTAGG	P	TGTGCCATTTTTGCATTCCT		GGATTCTGACCATTTCAATAGGTGC	AAATTCAAAAAATGAAATACTATTACGCACCTATTGAAATGGTCAGAATCC
838	1450	AATTTTTTTAGAGAGATATCATAAGGAGCTC	P	AAAATTCAACAGTTCTCAACCATTTC		ACCATTTCCTTTAGCAATCGCCCAT	TAGTTAATTTCCATCATAGTCTATGCATGGGCGATTGCTAAAGGAAATGGT
839	1451	TGCAGAGCTGGGAGAAAGAA		GTAGTGGAGATAGTACCTGAACCCC	P	AGTGTGATAGAGTAGTAAGXGCATGGA	TGTGATAGAGTAGTAAGTGCATGGAGTTTTACTTAAGTCAGAAATTGGGGT
840	1452	GTGCGATCTGGGCTCACT	P	CATGCCTGTCATCCCAGC		TACTGGGGAGGCTGAGGCAGGACAA	AGTCTCTGCCTCCTGAGTTCAAGTGGTTGTCCTGCCTCAGCCTCCCCAGTA
841	1454	ATTGATATTCGCAAGGAAAACACA	P	GTCACTGCTGCTGCCTTCC		CCTTGGCTAATATGATTCAAAGAGA	TTGCCCTTTCCCCTTGAATTTGGAGGTCTCTTTGAATCATATTAGCCAAGG
842	1455	TTCTAGAGAGGCAGGGCCTAG	P	GACTCAAAGGAAGAGACTCAGGATC		AGTGAGGACAGACCCAGAAACACAG	TTCCTGGTTTGACCCCTTCCCACCCCCTGTGTTTCTGGGTCTGTCCTCACT
843	1456	CCACACAAGAACATCTACACTACGAT	P	TGCTAACTATTGTATAACCTCTATAACCATGA		TATAACCATGACTTGTGAGCAGTAA	TTTTGCTCCTGTGATGGTATGTTAGCTTACTGCTCACAAGTCATGGTTATA
844	1457	CTAGCTCGGTACCCTGACCAC		TGCTTTCTGCTGTAGGGTCTG	P	TTGAATAAGAXTTGCTCACAGAAAAAT	GAATAAGATTTGCTCACAGAAAAATAAGCTTAAATCTACAATGAATGCCAG
845	1458	TTATTGAAGGCCCTGTGGAC	P	CAGGATCTCCCAGGTCCATC		CATCCXAATATGTGCTTTGTCCACTTT	CCCAGTGATGCCCAAGGGCCTAGTCGAAAGTGGACAAAGCACATATTTGGA
846	1460	TAATGCCAGCTCCTCGGG		GTATTTATTTAGAGACCGAGTCTCACTCA	P	GCGGGAGAATCGCTTGAACCAGGGA	GCGGGAGAATCGCTTGAACCAGGGAGCGGAGGCTGCAGGGAGCCGAGATC
847	1461	GTGGCAAAGCCTTCACAACTAG		AGAAGTGAATGGGAGAAAAATAGAATATG	P	CCATCTGTAGACTGTCAAAXTATGTAT	ATCTGTAGACTGTCAAAATATGTATGTATGTAATTTTGACGTATGAACCTG
848	1462	TTCAGTGAGTTGCGTGAATTC		GGGCACCCTTATCTTTGACAC	P	TCTAGTGAATTATAAAATCTAAGGA	TCTAGTGAATTATAAAATCTAAGGACGGATTTAGGAATCCCCTTAAATTTG
849	1463	ACCATTGGCAAGAGCTAAAAG	P	GTAGCAGCGCCCAGTTTTC		ATTGTAGTTCATTTGACCCTCCCCA	TGGACACAAGCCGGATGGCCCGCGGATGGGGAGGGTCAAATGAACTACAAT
850	1464	ATTAACCTCAGCGATTGTTGCT	P	CTATTGAGGAGAGGATGGGAGG		CCAGGCAGGGCCACCAGGAAGAGCG	ACACCTGGGTGAGTTTGGAGCGCTCGCGCTCTTCCTGGTGGCCCTGCCTGG
851	1466	TTGCAGAGTCTATGTCGATTCTAGAG		GAATACTGTCGGACACAGCACTG	P	TGAGCAAGATTGTGACATAGGTAAAGTTGTGACGGGGGTGTTTTTTGTGCA	TGAGCAAGATTGTGACATAGGTAAAGTTGTGACGGGGGTGTTTTTTGTGCA
852	1467	AGGCCAAGCTAGTCCACCTC	P	CATCCGGTAATTAGCGATGCTA		TCCAAGGAACCAATCATXAAAGAACAC	TGGCTTTCCTCTCTTTCTTCCAGCACGTGTTCTTTAATGATTGGTTCCTTG
853	1468	TCATTCCAAGGGTGATGGC		AAAAAAGAAAGAAAGAAAGAAATTGGC	P	TGTAAGCAAGGGCAGCACTCTGGGT	TGTAAGCAAGGGCAGCACTCTGGGTCCGACGGGGAGAGTGAGCGGGAGAGT
854	1469	AGGAATTCAAAATCTGGACAAAGAC	P	TGTCATTTACTGCCCAGAATAACTG		AACTGCCCTGXAGATTGCTTTTCTTCC	GGCTCAGGAAAGAAAATTTCAGATGCGGAAGAAAAGCAATCTGCAGGGCAG
855	1470	CTTTAGCTTATACAGTGTGCATGAAGAA		CAAGCACTTAAAAATTCTCTATTTTACATAAGG	P	AGCACAATGCAAATAGAAAACCGAA	AGCACAATGCAAATAGAAAACCGAAATTTTATTTTCCTCACAAAATTATAT
856	1471	AGGTGCCCACTCATTCTGC		GGGGAGCCAGCCTCTTCT	P	CCACATGGACCACAAGTGCTGTCTC	CCACATGGACCACAAGTGCTGTCTCGGCTCAGTGTGGTTCCAGAGAACCTG
857	1472	TACTTGGATGGAGCATGTCAAG		CTACTTTAGGCAGGGACCGAA	P	GTCCATCCATCCTATCAACAAATCT	GTCCATCCATCCTATCAACAAATCTCTAGGAACTTCTACCATGAGCAAGGC
858	1473	TTATGAAAAACCCACAGCCAATAT	P	CATGGATCACCTGTTCCTGG		AATTCATTCTCCCATTTCTTAGGTT	TGAAAACTGGCACAAGACAGGGATGCAACCTAAGAAATGGGAGAATGAATT
859	1474	TTGCCTATGGTTAGGGTTGTGA		GTAGCCTTGTCTGTGGGCC	P	AAACCTCAGTGGTGCCAAAXATCAAAA	ACCTCAGTGGTGCCAAAGATCAAAAAGGGTTATTTGGGAAAAGCATGCCCT
860	1475	CTTTGATGTTTATTGATATGACACCG		AGTACCAGATTTTCAAGTTACATAAGTGAAC	P	TGTTTAAACAACGCAAGTATGTCCA	TGTTTAAACAACGCAAGTATGTCCACGTGTTTCTTATAGGGTACACTTGAA
861	1476	ACGTCTTAAGCACCTTTCTGCA	P	AAGTGACAGGATTCAGAAGCCA		TATCAGAAAAATCCATCAGGXCTCAGC	TCCCTACAACACTTTCTGTTGCTTGGGCTGAGCCCTGATGGATTTTTCTGA
862	1477	TGGAGGCCCAGAGGACGC		GAAACTGAGTCTGGATAGGGGTAAG	P	AGGGACAXGATCTCTGTGATTTCCTAA	GGACAGGATCTCTGTGATTTCCTAACGGGGACATCCCCAGGCTCCTCTTAC
863	1478	TGTGGTGAGCCAAGATAGCTACA	P	CCTTCCCAATTAAAAGCAGCTAAT		TTGATGTTCAGATTTTCCTTTTTTT	AAGAGTGAAATTCTGTCTCAGAAAAAAAAAAAAGGAAAATCTGAACATCAA
864	1479	TTTAGCTTTGGGCAGTCGAC	P	GGCCAGCAGCTTGTGGAT		GTGCCCGGGATGCCTGTATCTATGC	GTTTCTGTCTACTCCAACGTCCACGGGCATAGATACAGGCATCCCGGGCAC
865	1480	CTCATAAATTTCCATATTGTTTCTCTGTACT		AGGAAAAACTGCCTCACCAAA	P	GTTGAAGTGCACAGATTTTTTTTTT	GTTGAAGTGCACAGATTTTTTTTTTAAAAAAAACAGCTATTTGAATTTTTT
866	1481	TGATGGACAGGGCCATAAAG	P	CTCACCTAACCCTGCCCC		CTGACAGTATTTCTCCACCCGCCCT	GTTTATGGTTTTTGTGATCAGCTACCAGGGCGGGTGGAGAAATACTGTCAG
867	1482	ATCCTGTTAACTCAGGAGCTGACC	P	CTTTATTTTCCCACCTGTTAGACATTC		ACAGXGATTTGGCCAGTTGTATTTCAC	GGAAAACACTATCTAGTTCCATTACCGTGAAATACAACTGGCCAAATCACT
868	1483	TTTTTGAATGTTTTGGCCCA		GGAAGCAGGAAAAAGGTCCC	P	ATGGCXGGCAGXTTCCAGCATAAGTCA	GGCTGGCAGCTTCCAGCATAAGTCAAGCTCCCCATCCCCCAGGGGACATGG
869	1486	AATTCTAGCTCGGTACCCGG		CATTTTACTTGAACACAGACCGAAG	P	TTAAATCTGAGTGXAACATCCGTAGAA	AAATCTGAGTGGAACATCCGTAGAAGTAGCTCACAGACAATGCAGAAGTAG
870	1487	GCAGGTGTTCTGACTCAGCC		CTTAAACCAGAACTGCCTAGCAAA	P	CTTTGATGXACACACTGCTGCTCATTC	TTGATGCACACACTGCTGCTCATTCAATCTAGGGGCAAGTCTCATTTTGCT
871	1488	CCATTCACAGATGCAGTAGAGTGA		AAATACTTGATAATTCTTGGACTTTCTCTTT	P	ACTGTTCTAAGATTGAAACTAAACC	ACTGTTCTAAGATTGAAACTAAACCGTACTGGGTTTGAAAAGAGAAAGTCC
872	1489	CAACACAGTAACATATTCATGAGTTTTTAAA		CAGGCTGAGACAACCCATCA	P	CACTTGGTGATCTCTGACAATGTTA	CACTTGGTGATCTCTGACAATGTTACGTAGCCTGAACCTGGAGTTTTGGCT
873	1490	TCTCTTGCCTTAAATCTAGAGACAATCT	P	CAGGTGGAACAGTGGAAGCA		AGCGACAAGAATGTAGACAGGCTAC	AGGGATAACTCTGAAGAACAGAATACGTAGCCTGTCTACATTCTTGTCGCT
874	1491	TGCACAACAGAAGGAAAGGTG		CCTCTCTACACTTACCGTTTCTGC	P	TCATTCATCCACCTTTTCCTGTCTC	TCATTCATCCACCTTTTCCTGTCTCCGGCGTGTGCGATGCTCCCGCGTGTGG
875	1492	TCTTAGAAAGTGATCTTTGGGAATATAGG	P	GAAATCTTCTATCTAGTCATGCCTCAGT		GTCTTCTTCTCTAAATGCTTCCTCT	TTGACATGTGGAAGAACTCTGTTTCGAGAGGAAGCATTTAGAGAAGAAGAC
876	1493	TTGTCTAAGTGCTCCTTGTAGAGAAG		CAGAGACGCCTCGGCTAG	P	CAGXACTGACGAAGATGCGGACAAAGC	GCACTGACGAAGATGCGGACAAAGCGGGGGGAAGGACACCCCTGCCTTTGTG
877	1494	AAGGTGGTTAGCCTGGGG	P	CCAGCCTTGCTGTGGGAG		GTCTTTGGAGGGAATGAGTAGAGCC	CTTCTCCAGAGGCAGATGAGACTTCCGGCTCTACTCATTCCCTCCAAAGAC
878	1496	CTCCCCAAGGTCGTGAATT	P	ATGGTGGGTGTAGGTGCGT		GTTTTCTCCCACCCCGTCCXGCTCTAG	AGGCTGCCCTGGAGAACTGGAAGCCGCTAGAGCTGGACGGGGTGGGAGAAA
879	1497	ATACACACACATCTACCCCAAGGA		CATCTGGGCTGATGGTGC	P	GACCAGATAAACACAXGTXGCCATCTT	CCAGATAAACACACGTGGCCATCTTGGACCATGGGGCAGCCAACAATGTGA
880	1498	GAGAGTTTTACTTCTTCCTTTTTGGTCTA	P	AGATTCTGGTGGCAGAAAGACA		GACAAAAACGTACATTCATTTATTC	TGCCACTTACATTTCTATGTATGTACGAATAAATGAATGTACGTTTTTGTC
881	1499	AAGAGTATGTTGAGACAGCAATAAGAG	P	TCCTGATCTAGGTTCTGGGATC		CCTAACTTCTCTCAGCCCCGTCTTC	ATAGATGCACCCACCTGGCAGTGGACGAAGACGGGGCTGAGAGAAGTTAGG
882	1500	TGGAGGAAGAGGTATTTAAGGTTTG		CCAGGTGTCAAAAACCTATACTATAATCTC	P	TAAGATCATATAGGGGGCTGGACGC	TAAGATCATATAGGGGGCTGGACGCGAAGATCTGAACCTGAGATTATAGTA

Row#	REF#	1 Upper PCR primer	Modified	2 Lower PCR primer	Modified	3 GBA primer	4 Flanking sequence
883	1501	CGTGGTGGCTCACACCTG	P	CTAATTTTTGTATTTTTAGTAGAGACGGGG		ACTCCTGACCTCAAGTGATACACCC	ATCCCAGCACTTTGTGAGGCCGAGGCGGGTGTATCACTTGAGGTCAGGAGT
884	1502	AAAGCAAAAAACAACAAACGATC		CAGAGGGCTTTGGATGCA	P	CAGAAAGGTCAAXTGCCTCACTCAAGG	GAAAGGTCAAGTGCCTCACTCAAGGCCACACAGCTAGCACTCAGGTCTGGC
885	1503	GGTTGAAACAAATCAAAACAAAAAAG	P	ACCGTAACTGGGAGTCACCTG		CAATGTTACAAGCTCAAGCATGGTA	CTCCTTGGAGCTGTCCTAAATTCATATACCATGCTTGAGCTTGTAACATTG
886	1504	CCTGCCTCAGACAACACAGC	P	GTGGCTTGGGGATTTGTG		GGCCACCGGCCACAXCTCACCCAGC	GACAGACGAACATCTGTTAAAACTCCGCTGGGTGAGCTGTGGCCGGTGGCC
887	1505	ATTAGGACTTATCCCTGTGCCAA	P	CAAATAATATAAGAGCTCCTGAGTGGG		ATATCTCTAGAGCACATTTCAAAGT	GCTACAACTTTGTTGCTTCGAGTTTGACTTTGAAATGTGCTCTAGAGATAT
888	1506	GCTGAGTGTATTTGTATGGGTCTATTTC	P	TCAGGTGACTGACACTATTCAATTTC		TAAAACAGTGTAGTXTTGGAGAAATAA	TTCTGTTTTAGTGATCTATTCGTCTATTATTTCTCCAATACTACACTGTTT
889	1507	GGAGTCTTTCCTGTTGGTCAAGT		AGTTGAGGCTTGATAGGTATTTATTGAAT	P	TCTGGGTTTGACTACTCATTCATTC	TCTGGGTTTGACTACTCATTCATTCGTTTGATCTTTCATTCATTCAATAAA
890	1508	CCTTCGGAACCTTTCAACACA	P	TGAGCTAGAAAAGTAAATGTGTCAGTCC		GTCAGTCCTTGGTAGCXAAGTTTGTAC	AGAGGATTTGGATAAAATTTATAAACGTACAAACTTTGCTACCAAGGACTG
891	1509	CCCAAGGTGCTCTAAGGCA	P	GATAATGTGCTTTCAGGAAAAACAA		CTTGXGCAAGTCAGTAACCCTGAGTGT	GCCCCGTTTTACAGAGGAGGCAATTGACACTCAGGGTTACTGACTTGCCCA
892	1510	CAATGGATTTCAGGCTTCTTAGG		TCTGAGTTTGGCAAAGAAAGTACC	P	AGAGCTTTCATCATGGCAAGACATC	AGAGCTTTCATCATGGCAAGACATCGACTCTTTTGAGGAAATTCCAAAGGT
893	1511	CCAGTGGCTCATCTCGTGG	P	GTCTGATTTCTGGTGTTGGGG		GACAAGGTTTCTAGAGGTAATCACT	CAGCGGCTCATTCTAAATGTAATGTGAGTGATTACCTCTAGAAACCTTGTC
894	1512	GCAGTCTGAGAGATATGGATGACATAT	P	AGTTAGGTTCATTTGTTTCATTTTCCT		TTCTTTTTGACTTTTTATCATTGTA	GACTCGGGAATCATGTAAGTTTCTTCTACAATGATAAAAAGTCAAAAAGAA
895	1513	ATTCAAGCACGAGAAGCCC	P	CAATAGGTGAAGAGGGCCTCC		TGAAGGTCATACAACCAGAACCCAC	TGGGCACTGGGAGGAAGCTGCAACACGTGGGTTCTGGTTGTATGACCTTCA
896	1514	TTTATTCCCATCTTCTTATTCATAACTCG	P	ATTGGAGCCAGGAGAGCAC		ACAGAGAGAGAACCTAATCCXGCACGG	GCCGGACGATGATGCCGCTGCTAGAACCGTGCGGGATTAGGTTCTCTCTCT
897	1515	ATCAACAACATCCCCTCCTCA		GTACAGATGGGGGGTCATGA	P	CCCCGTCACCCACCTCACTGTCCTC	CCCCGTCACCCACCTCACTGTCCTCCTCATCCCTATTATCTGGGAGGTCCT
898	1516	GAGTAGTAAGGAGTTTAGAAGCGTACAAAC		CTGACCCTCGATTGGTTTCC	P	GCTCTGTACTCACATTGGATTTTTG	GCTCTGTACTCACATTGGATTTTTGAGAGACCTTGAGGGTGGGAGCTTTTG
899	1517	TTTTCCAGTCTGAAACATAAAGGAA	P	GCCCACCTTGGCCTCCCA		AAGTGCTGGGATTACAGGCGTGAGC	AAAATGCTATTGGACCGGGGCGCAGTGGCTCACGCCTGTAATCCCAGCACTT
900	1518	CAAATACGTGTTAATACGACCATGA	P	CGCCTCCGCCTCCCAAAG		AGTGCTGAAATTACAGXCGTGAGCCAC	TAAAAGGCCCTTCCTGGCCGGGCGCGGTGGCTCACGCCTGTAATTTCAGCA
901	1519	TCCGTGGCAAAGACATAACTAAG	P	GTTGCTGTGAAAAGAAAGTAAATGAGA		AAATGAGACAGAGGAGCCCAGCACT	CCCGCATGTGACCTCCCCCAGGGCGGAGTGCTGGGCTCCTCTGTCTCATTT
902	1520	GAAGGCTTCCCTGAGCCTG	P	GTGCCACTTGTAAGCGTGAAC		TGTCCGTCTCCTCTTCAGCAAAATG	CCCTCATTTGTGCTGGTGAAATGTCGCATTTTGCTGAAGAGGAGACGGACA
903	1522	CTGTTTTCAGGATTATCCAGCAG	P	TCCTGGGTCAAGAAAAGTCTG		GTTCGAAAATGTGTCAGTAAGTGTG	CGTTATTTAAGAAATCGTGATGGAAGCACACTTACTGACACATTTTCGAAC
904	1523	GCGCATCATTGCCCTTTC	P	CTTACTTTCTCCATTTACCTTAGAGGGA		AATCACTTACATTAACAAGAGACTC	ATTACAGACTTCACATCAAGTTCAACGAGTCTCTTGTTAATGTAAGTGATT
905	1524	AATATTCACCAGCCCTGCC	P	GGCCTGAGGGAGGCAAAG		AGGCACTCTCTAXGTGGCAACATCTCA	TCTTATGGGGTTAGAAAAAGCTATCCTGAGATGTTGCCACATAGAGAGTGC
906	1525	TAATCCTTTTCTGCCCCACTG	P	CATGTTCTTTTTGTGATGATGGC		CAAXATTCTATCATACAACATCTGCTC	TGGCGTGACTTTGGCCAATTGAATGGGAGCAGATGTTGTATGATAGAATCT
907	1527	AAATACTGATTTTAATGGTTTGTGATGC		CTTCCTGTTCAACCTGTACCATATG	P	CCAGGATCAAAAACTCCACAGGTGA	CCAGGATCAAAAACTCCACAGGTGAGCTGCATAGGCAGCCAAGATTTAGAA
908	1528	CGCACACTCGGGACCCAA		GTACAGACGCCCCTGCTG	P	CTCCCAGGGATXTCCCAGCGTGAGAGC	CCCAGGGATCTCCCAGCGTGAGAGCAGGGACGGGACTGCGCCGTCACACCT
909	1529	TAAACAAAGATGCAATTTACTACCAGG		CTCCCCTGTGCCCAAGGT	P	CCAAGGGGGGGGGGAAAACTTCAAC	CCAAGGGGGGGGGGAAAACTTCAACGGTTCTCAGAAGGGGCCTTTCCAACT
910	1530	AACCCACATCTATGACATGATTACG		GTCTTTTGACACCTATACGTCTAAGGG	P	ATGTAAGGGTTTTTTGACTTTCTAT	ATGTAAGGGTTTTTTGACTTTCTATGTGCTGACTTCATAAGATGTCACTCC
911	1531	AGACTCCCTGGGGCTAATTT	P	GAACTTGTTGATGTGTCTGTGGAA		AACACATGAAGATCCCAAGGXTCAGCA	GGTGTCACCACTGACTTCCTTGAGGGTGCTGAGCCTTGGGATCTTCATGTG
912	1532	GGAAAGAGATGGTGTGGGG	P	TGAGCAAGGTCATTGTAATACAGAAG		TAGACGAATAATAAAGGTAAAGGTT	ATTATTACAGGAAAATTTTAACCGAGAACCTTTACCTTTATTATTCGTCTA
913	1533	TGACCCCATCTATGACATCATTAC	P	CAGGAGGGAAAGAGATGAACATT		CATTCATGGGGTCCTTACAGCAGAT	AACTGTAAAAATAAGGACATTACTACATCTGCTGTAAGGACCCCATGAATG
914	1534	TGCTTGTTGGCATGAGCA		CACAATCGCCAGGAACACA	P	TGCACATAAAAGCCAAGACTCACTT	TGCACATAAAAGCCAAGACTCACTTCCTTTGGGACAAGTCAGAAAAATCCT
915	1535	AGCTTGACTCTATTTTAGCACTATTTG		CTGCTATGGCTCTGGCACTAG	P	CTTGACTCTATTTTAGCACTATTTG	CTTGACTCTATTTTAGCACTATTTGGGGTGGAAATGGCAACCCATCCTTCC
916	1536	TGAACAGCATGACATGATTACGA		CAGTGAGCTGAGATCACCAGC	P	TTCGAGCTCGGTACCCCTGCCTCAT	TTCGAGCTCGGTACCCCTGCCTCATGAAGGCCTTTTCTTCTTCTTTTTTTT
917	1537	CTGTAGCCAAGCAGGGGTT	P	GATTCATGATGGGAAAACATCAA		TGCCATCTTCTCACCACCCCAAACA	AGCAGCCTGCAGCTTCAACAAGGACGTGTTTGGGGTGGTCAGAAGATGGCA
918	1538	AGGGGGCGTCTGCTCTCA	P	CTCCAGGAGCTGTGGGGA		TGAAGGACACCCTGAGCGGAAGTG	GACCCTATAGAAGGCTCAGCTTCCCCCACTTCCGCTCAGGGTGTCCCTTCA
919	1539	TCTCAGGAGTCAAAGCGCAT		CACACTGAGAACCTCGCTCTG	P	TTACCTGTGTTAAAAGCAAGACTCT	TTACCTGTGTTAAAAGCAAGACTCTGCATGCTTATTCTCACATCAGTCAGA
920	1541	TTCTTTAATTCCAGGAAACAATATTCC		GTTTCCAGGTGACAGGCAAA	P	ACCTGCTXAAGTTATTCAAACTAGCCA	CTGCTGAAGTTATTCAAACTAGCCAATCCTAAGCCTGCTTACTTGGCTTGG
921	1542	CTGGCCTCATGACCTTTTTTAA	P	CTCATGACATTTTTCCCCACAT		ACTACCATTCACCAGATTATCCCCC	GTGTGAGTTATCCCATTGTACATGGCGGGGGATAATCTGGTGAATGGTAGT
922	1543	AATGTAGGAGTCACCTCCTCCT		CTTTCTGGGGATGGGGAG	P	CTGTCCCTGTTTCCTCATCCCCACC	CTGTCCCTGTTTCCTCATCCCCACCCCCTTCTCAGCCACCCCACAACACAGC
923	1544	TGGGTCCCCTGAATTTATAATGA	P	AGTGCCTCTCTCAATAGTTGGCT		CACXGTATCCAACGCAAAGCAAGACTG	ATAAATAATAATAGCTAATATTTATCCAGTCTTGCTTTGCGTTGGATACTG
924	1545	ATCTCTACTAAAAATACAAAAGTAGCCAGG	P	CAATCTCGGCTCACCGCA		CCTCCCGGGTTAGAGCGATTCTCCT	AGTCCAGCTACTCAGGAGGCTGAGGGAGGAGAATCGCTCTAACCCGGGAGG
925	1546	ATATGGGTTTTCATTTTTAAGATTGGT	P	CGTTGCCTCCAGGAGAAAG		AAGGCGTGCTGGCGTGAGXCCACAGTC	GGTCCAGGGAGCTGCCCGGCATTGCGGACTGTGGCCTCACGCCAGCACGCC
926	1547	TTTTAGTTTTAAAGCTGAGAAAGCCC	P	TTGTCAAATGGGTAGGTTACTCAAA		TACTCAAAATTXCATAGTGGGACTGAA	CAGAGCATGCTGTTGGCCAGGGATAATTCAGTCCCACTATGAAATTTTGAG
927	1548	GATTTCTAGCCTCCAGAATTGTGA		AATGTCTTTGTCCTTTTTGGGC	P	AAATGTTTGTTGTTCAAXCTACATAGT	ATGTTTGTTGTTCAAGCTACATAGTCGATAGAACGTTTGTTATAGTAGCCC
928	1549	GTGGTGGCTTCTGTCTTAGGTC		GTAATGGAAAAGGCCCAGGA	P	CTCTCTCTTCCAGTGATTTCTCATA	CTCTCTCTTCCAGTGATTTCTCATACTTTGAGGGACACTCTGGCCTGCTTT
929	1550	TGTCTCAACTTTTCCATTTCTGC	P	TGTCCACTCACCTGCTCCG		CCGACXCCCAAACCGCTAAGGAGAATT	AATCCAGGCACAGGCTGGACCCTCAGAATTCTCCTTAGCGGTTTGGGAGTC
930	1551	TCAGTGCACCCACATGCC		CGAAGTGCTTGGTGAAGGG	P	GTAGTGGGTGCTCTGGAAGTACCGC	GTAGTGGGTGCTCTGGAAGTACCGCCAACATTGACCTGCATAAGGGTCTAC
931	1552	GAATTGGTCCTTTCACAGCATC		TGTGGTGTTTATGTAGTATCCTTTTTCC	P	CAGATCTAAACTTTTCXTACAAGGTTA	GATCTAAACTTTTCCTACAAGGTTAGGTACCAAAGGAAGAGCATTAGAGGA

Row#	REF#	1 Upper PCR primer	Modified	2 Lower PCR primer	Modified	3 GBA primer	4 Flanking sequence
			-		-		
932	1553	CCCAGGAGAGACAGTCAGGA	P	TTAAACATTAACCAGCTCCTTCCTC		AGCXCACAGAGGAGAAGCGGAGACTCA	ACTGGGAGGGCCAGGAGAGGCCTACGTGAGTCTCCGCTTCTCCTCTGTGCG
933	1554	TGCTTCTGCCCCCACAGG		CATGACAGTTTTCTGGAGGCC	P	TATCAGAGGAGXTGGCTTTTCACACCA	TCAGAGGAGGTGGCTTTTCACACCAGGGCAATATTTTTAATCAAGAGTGTG
934	1555	TTGCCTCCCTGGGTGGGC	P	CACACTCCCATGCAGGAGT		TGACAGAGCAGTGAGCCAAAACCCC	TCAAAACATGAGCTTTTCCAGGGGTGGGGGTTTTGGCTCACTGCTCTGTCA
935	1556	AAGCCTCAACTATATACTGTGCTCTG		GATTTCATTTCCATCTCTTTTCCTAG	P	GTGGATATATTGAATXCAAAATCAGGC	GGATATATTGAATGCAAAATCAGGCGTGGCCCTTGCCCTCATAGAGCCTAG

While the invention has been described in detail with reference to certain preferred embodiments thereof, it will be understood that modifications and variations are within the spirit and scope of that which is described and claimed.

We claim:

1. An oligonucleotide comprising a nucleic acid sequence selected from the group of SEQ ID NOs consisting of SEQ ID NO:4n+3, or complementary sequences thereof, wherein n=0 through 934.

2. The oligonucleotide of claim 1, wherein X, when present in said oligonucleotide, corresponds to a single-nucleotide-spacer selected from the group consisting of anucleosidic moieties, abasic moieties, non-naturally occurring nucleotide analogs, and non-Watson/Crick base moieties.

3. An oligonucleotide comprising a nucleic acid that hybridizes with a first portion of nucleic acid selected from the group of SEQ ID NOs consisting of SEQ ID NO:4n+4, or complementary sequences thereof, wherein said first portion to which said oligonucleotide hybridizes also hybridizes with a nucleic acid selected from the group of SEQ ID NOs consisting of SEQ ID NO:4n+3, and wherein said oligonucleotide does not hybridize with a nucleotide base on said SEQ ID NO:4n+4, or complementary sequences thereof, corresponding to the nucleotide immediately adjacent the 3' end of said SEQ ID NO:4n+3, wherein n=0 through 934 and n is the same value for both SEQ ID NO:4n+4 and SEQ ID NO:4n+3.

4. An oligonucleotide comprising a nucleic acid that hybridizes with a first portion of nucleic acid selected from the group of SEQ ID NOs consisting of SEQ ID NO:4n+4, or complementary sequences thereof, wherein said oligonucleotide does not hybridize with a second portion of said SEQ ID NO:4n+4, or complementary sequences thereof, wherein said second portion of said

SEQ ID NO:4n+4, or complementary sequences thereof, hybridizes with a nucleic acid selected from the group of SEQ ID NOs consisting of SEQ ID NO:4n+3, and wherein said second portion of said SEQ ID NO:4n+4, or complementary sequences thereof, also includes a nucleotide base on said SEQ ID NO:4n+4, or its complement thereof, corresponding to the nucleotide immediately adjacent the 3' end of said SEQ ID NO:4n+3, wherein n=0 through 934 and n is the same value for both SEQ ID NO:4n+4 and SEQ ID NO:4n+3.

5. An oligonucleotide comprising a first portion of nucleic acid selected from the group of SEQ ID NOs consisting of SEQ ID NO:4n+4, or complementary sequences thereof, wherein said oligonucleotide excludes a second portion of said SEQ ID NO:4n+4, or complementary sequences thereof, wherein said second portion of said SEQ ID NO:4n+4, or complementary sequences thereof, hybridizes with a nucleic acid selected from the group of SEQ ID NOs consisting of SEQ ID NO:4n+3, and wherein said second portion of said SEQ ID NO:4n+4, or complementary sequences thereof, also includes a nucleotide base on said SEQ ID NO:4n+4, or its complement thereof, corresponding to the nucleotide immediately adjacent the 3' end of said SEQ ID NO:4n+3, wherein n=0 through 934 and n is the same value for both SEQ ID NO:4n+4 and SEQ ID NO:4n+3.

6. An oligonucleotide comprising a nucleic acid sequence selected from the group of SEQ ID NOs consisting of SEQ ID NO:4n+1, or complementary sequences thereof, wherein n=0 through 934.

7. An oligonucleotide comprising a nucleic acid sequence selected from the group of SEQ ID NOs

consisting of SEQ ID NO:4n+2, or complementary sequences thereof, wherein n=0 through 934.

8. A pair of oligonucleotides comprising two nucleic acids selected from the group of SEQ ID NOs consisting of SEQ ID NO:4n+1 and SEQ ID NO:4n+2, or complementary sequences thereof, wherein n=0 through 934, and wherein said primers correspond to two consecutive SEQ ID NOs having the same value for n.

9. A triplet of oligonucleotides comprising a nucleic acid sequence selected from the group of SEQ ID NOs consisting of SEQ ID NO:4n+1, SEQ ID NO:4n+2 and SEQ ID NO:4n+3, or complementary sequences thereof, wherein n=0 through 934, and wherein said oligonucleotides correspond to three consecutive SEQ ID NOs having the same value for n.

10. A kit comprising at least one oligonucleotide of claims 1, 3, 4 or 5.

11. The kit of claim 10, further comprising two amplification primers.

12. The kit of claim 11, wherein said primers comprise a nucleic acid sequence selected from the group of SEQ ID NOs consisting of SEQ ID NO:4n+1 and SEQ ID NO:SEQ ID NO:4n+2, or complementary sequences thereof, wherein n=0 through 934, and wherein said three oligonucleotides correspond to three consecutive SEQ ID Nos having the same value for n.

13. A kit comprising an oligonucleotide, wherein said oligonucleotide comprises a nucleic acid sequence selected from the group of SEQ ID NOs consisting

of SEQ ID NO:4n+3, or complementary sequences thereof, wherein n=0 through 934.

14. The kit of claim 13, further comprising two amplification primers.

15. The kit of claim 14, wherein said primers comprise a nucleic acid sequence selected from the group of SEQ ID NOs consisting of SEQ ID NO:4n+1 and SEQ ID NO:4n+2, or complementary sequences thereof, wherein n=0 through 934, and wherein said three oligonucleotides correspond to three consecutive SEQ ID NOs having the same value for n.

16. A kit comprising the two oligonucleotides of claim 8.

17. A kit comprising the three oligonucleotides of claim 9.

18. A method of genotyping a nucleic acid sample comprising hybridizing the oligonucleotide of claims 1, 3, 4 or 5 to the nucleic acid sequence selected from the group of SEQ ID NOs consisting of SEQ ID NO:4n+4, or complementary sequences thereof.

19. The method of claim 18, wherein said oligonucleotide is employed in a primer extension reaction.

20. The method of claim 19, wherein said primer extension reaction is a single-nucleotide primer extension.

21. A method of genotyping a nucleic acid sample comprising performing a primer extension reaction employing the oligonucleotide of claims 1, 3, 4 or 5.

22. The method of claim 18, wherein said primer extension reaction is a single-nucleotide primer extension.

23. A method of genotyping a nucleic acid sample comprising performing a primer extension reaction employing an oligonucleotide comprising a nucleic acid, or fragment thereof, selected from the group of SEQ ID NOs consisting of SEQ ID NO:4n+3, or complementary sequences thereof, wherein n=0 through 934.

24. The method of claim 23, wherein said primer extension reaction is a single-nucleotide primer extension.

25. The method of claim 23, wherein said fragment excludes from 1 up to 10 nucleotides from the 3' end of said SEQ ID NO:4n+3.

26. A fragment of SEQ ID NO:4n+3, wherein n=0 through 934, wherein said fragment excludes from 1 up to 10 nucleotides from the 3' end of said SEQ ID NO:4n+3.

27. A method of genotyping a nucleic acid sample comprising:

a) amplifying a target nucleic acid sequence that hybridizes to an oligonucleotide selected from the group of SEQ ID NOs consisting of SEQ ID NO:4n+3, or complementary sequences thereof; and

b) performing a single-nucleotide primer extension reaction employing an oligonucleotide comprising a nucleic acid selected from the group of SEQ ID NOs consisting of SEQ ID NO:4n+3, or complementary sequences thereof,

wherein n=0 through 934 and is the same value in both steps a and b.

28. A mixture of reagents comprising:
(a) 10 to 200 mM buffer, having a pH ranging from 6.0 to 9.0;
(b) 15 to 250 mM monovalent-cation salt;
(c) 0.5 to 25 mM divalent-cation salt;
(d) 0 to 0.02% volume exclusion agent
(e) 0.25 to 2.5 mM of each of dATP, dCTP, dGTP and dTTP.

29. A method of amplifying a nucleic acid sample comprising the steps of:

(a) combining two amplification oligonucleotides with said nucleic acid sample;
(b) adding to said nucleic acid a reagent comprising:

(i) 10 to 200 mM buffer, having a pH ranging from 6.0 to 9.0;
(ii) 15 to 250 mM monovalent-cation salt;
(iii) 0.5 to 25 mM divalent-cation salt;
(iv) 0 to 0.02% volume exclusion agent
(v) 0.25 to 2.5 mM of each of dATP, dCTP, dGTP and dTTP.

(c) contacting said nucleic acid with a nucleic acid polymerase.

30. An oligonucleotide comprising a nucleic acid sequence selected from the group of SEQ ID NOs consisting of SEQ ID NOs: 1-3740, or complementary sequences thereof.

Diagram of GBA Process

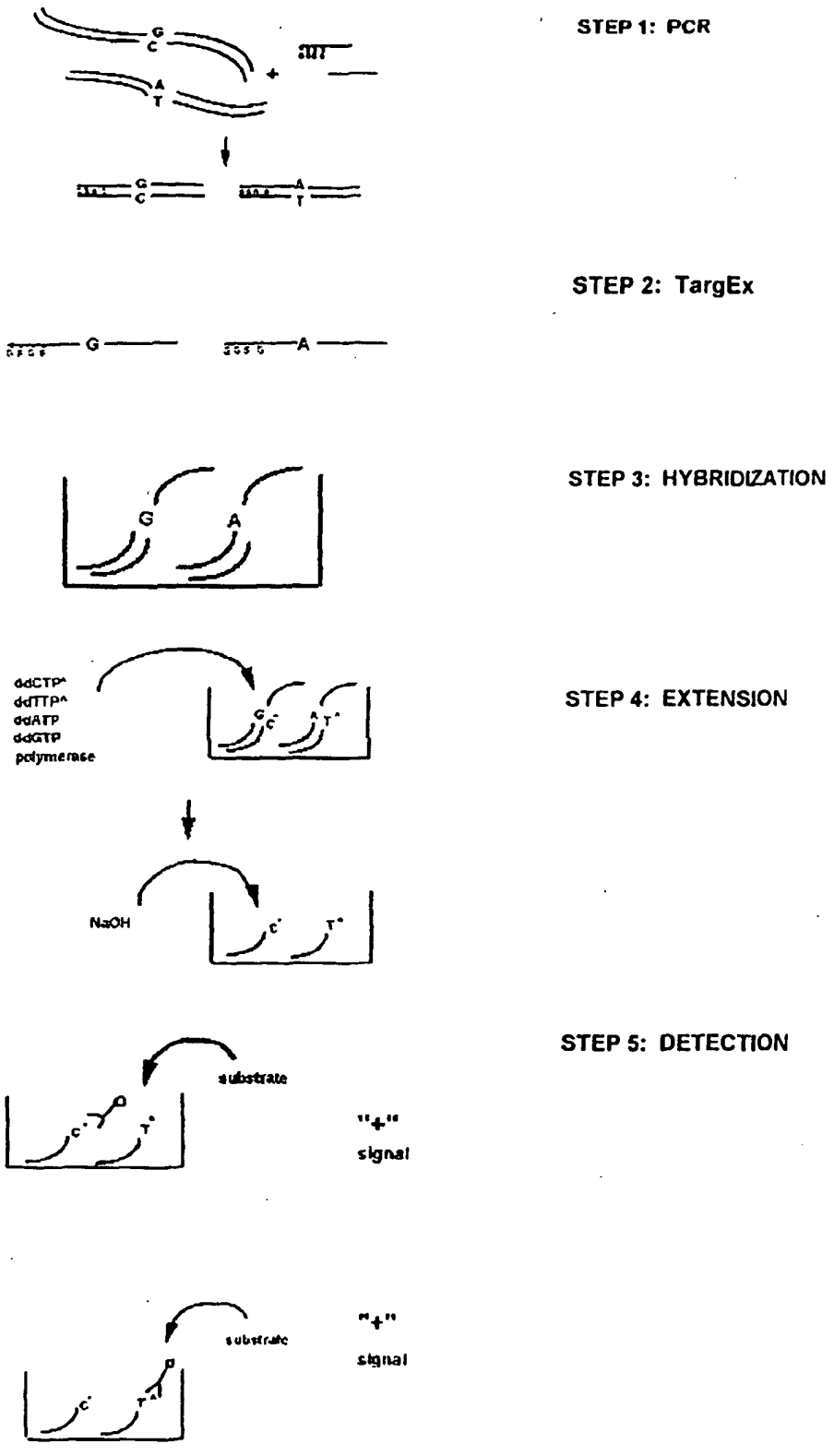

Figure 1

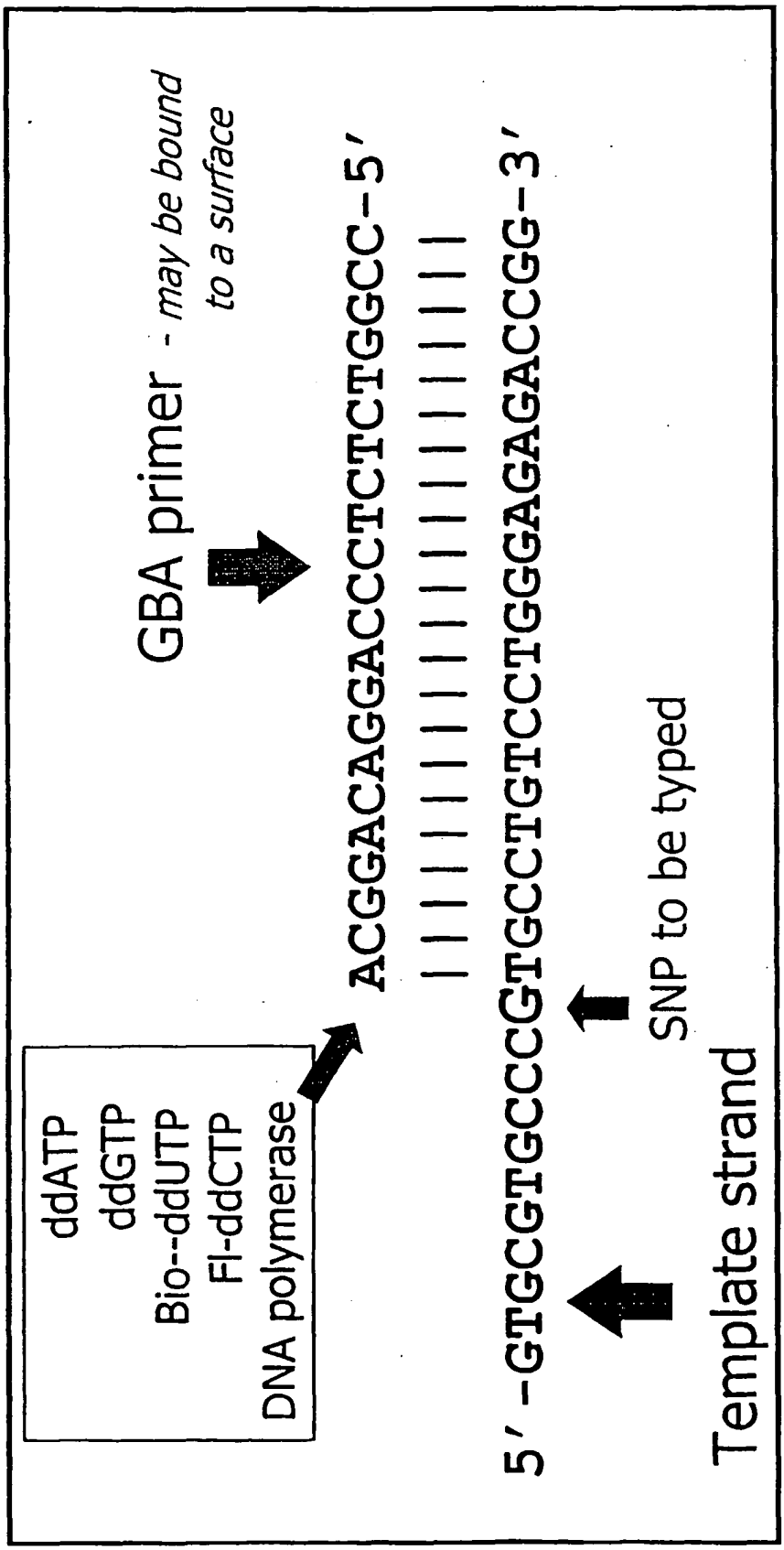
GBA primer - may be bound to a surface
ACGGACAGGACCCTCTCTGGCC-5′
5′-GTGCGTGCCCGTGCCTGTCCTGGGAGACCGG-3′
SNP to be typed
Template strand
ddATP
ddGTP
Bio--ddUTP
Fl-ddCTP
DNA polymerase

FIGURE 2A

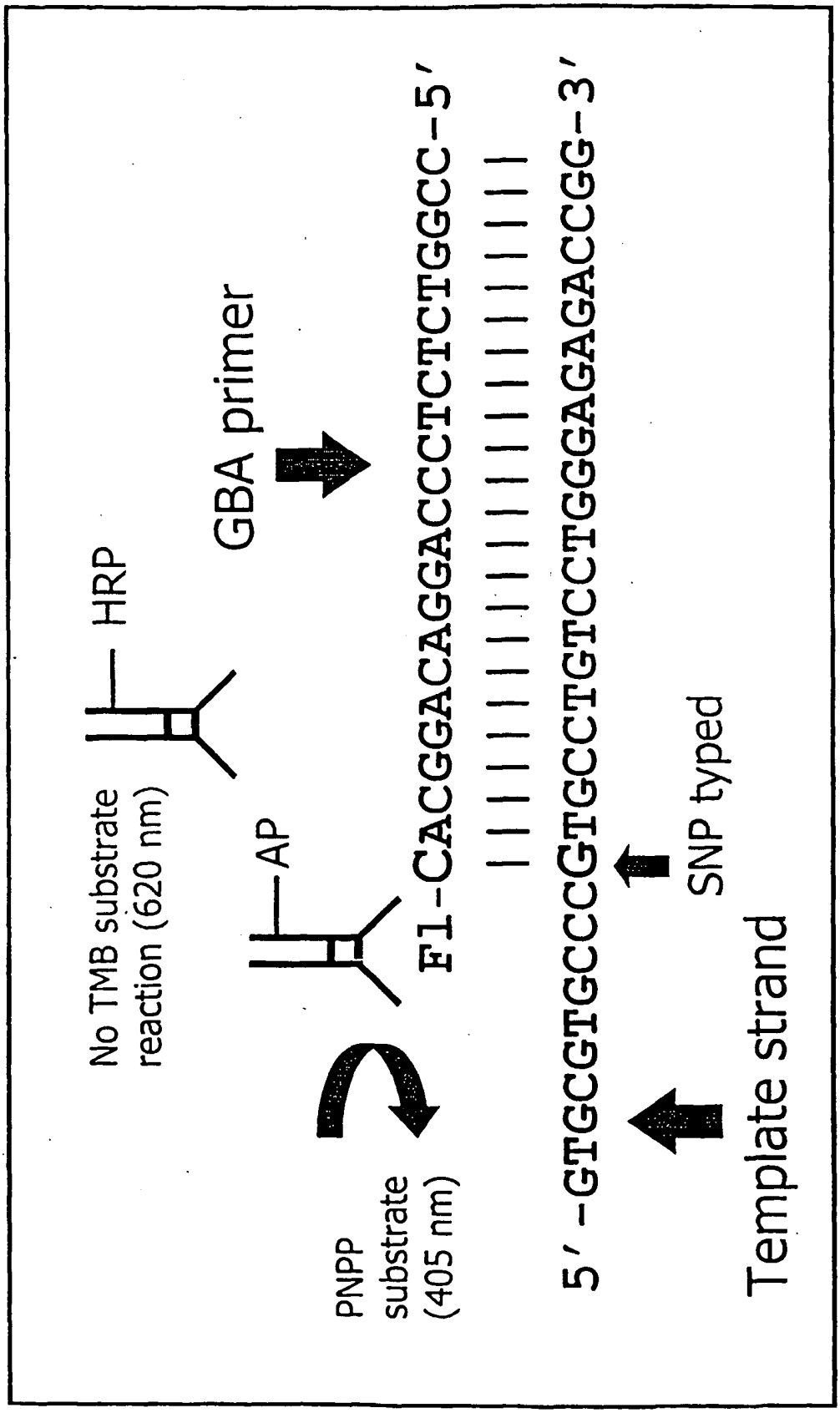
HRP
No TMB substrate reaction (620 nm)
GBA primer
AP
F1-CACGGACAGGACCCTCTCTGGCC-5′
PNPP substrate (405 nm)
5′-GTGCGTGCCCGTGCCTGTCCTGGGAGACCGG-3′
SNP typed
Template strand

FIGURE 2B

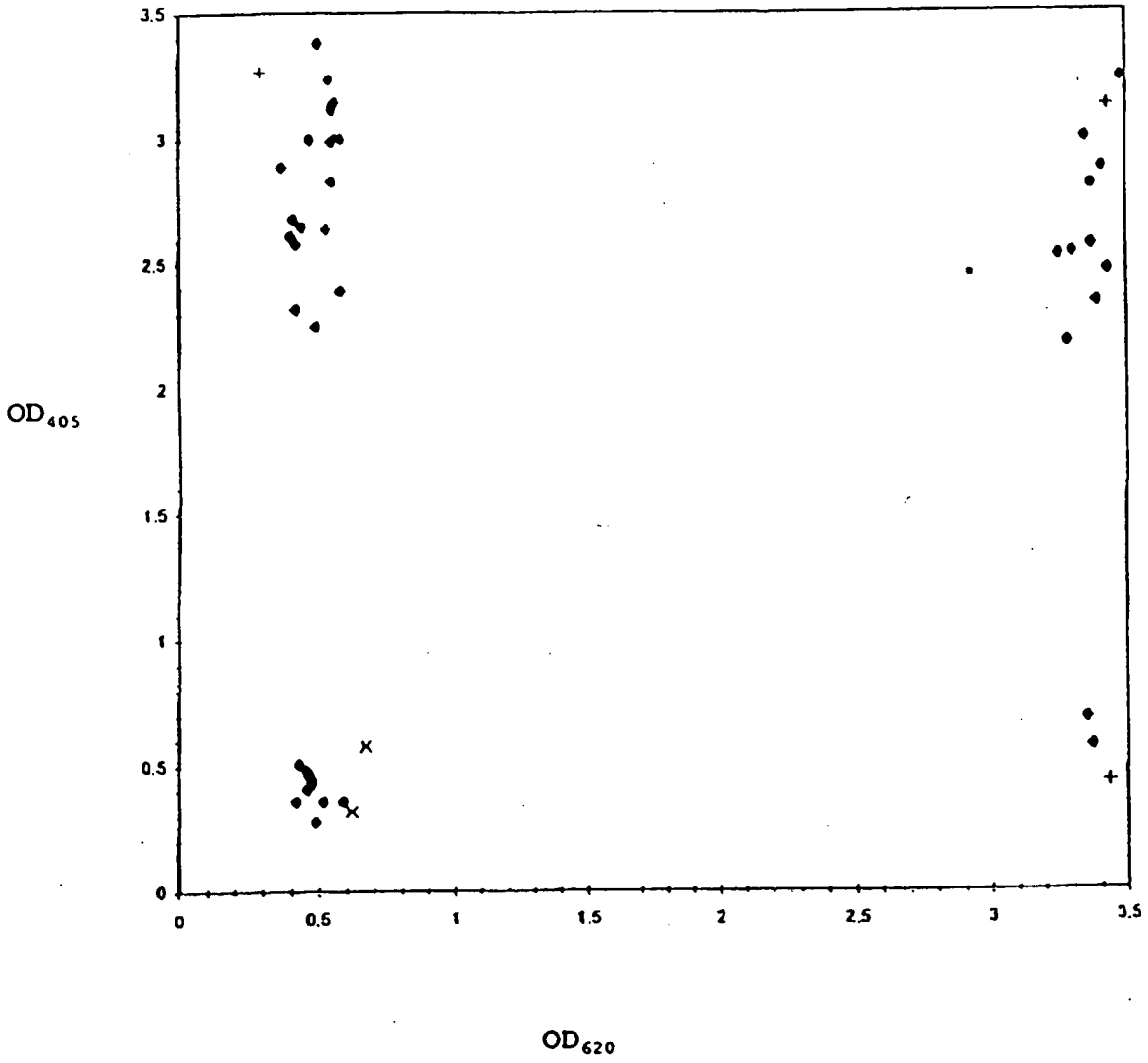

FIGURE 3